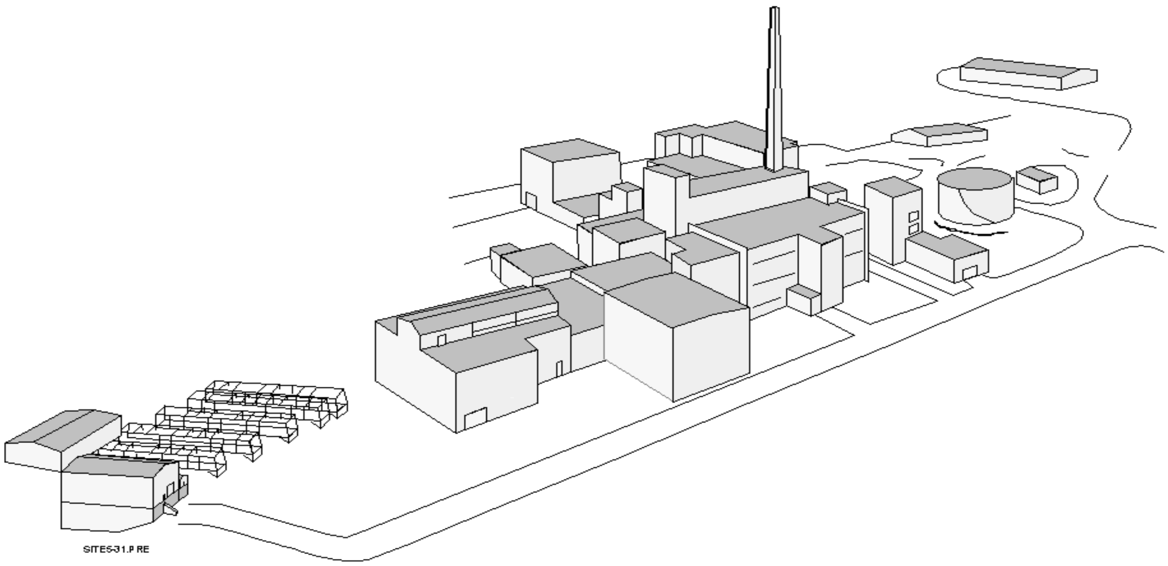
WEST VALLEY DEMONSTRATION PROJECT
ANNUAL SITE ENVIRONMENTAL REPORT
CALENDAR YEAR 2007



WEST VALLEY ENVIRONMENTAL SERVICES LLC
AND
URS - WASHINGTON DIVISION

Prepared by: West Valley Environmental Services LLC
and URS - Washington Division
Prepared for: U.S. Department of Energy
DOE-WVDP

Under: Contract DE-AC30-07CC30000

December 2008
10282 Rock Springs Road
West Valley, New York 14171-9799

Department of Energy
West Valley Demonstration Project
10282 Rock Springs Road
West Valley, NY 14171-9799

To the Reader:

This report, prepared by the U.S. Department of Energy (DOE) West Valley Demonstration Project (WVDP), summarizes the environmental protection program at the WVDP for calendar year 2007.

Monitoring and surveillance of the WVDP facilities are conducted to verify that public health and safety and the environment are protected. The quality assurance requirements applied to the environmental monitoring program by the DOE ensure the validity and accuracy of the monitoring data.

At the WVDP, radiological air emissions are controlled and permitted by the U.S. Environmental Protection Agency (EPA) under National Emission Standards for Hazardous Air Pollutants, Subpart H, regulations. Nonradiological liquid effluent discharges are controlled and permitted through the New York State Pollutant Discharge Elimination System.

Air, surface water, groundwater, storm water, drinking water, soil, sediment, and biological samples are collected and analyzed for radiological and nonradiological constituents. The resulting data are evaluated to assess effects of activities at the WVDP on the nearby public and the environment. Radiological monitoring of treated water effluents and facility ventilation system emissions verified that the dose received by off-site residents continues to be minimal.

The calculated dose to the hypothetical maximally exposed off-site individual from airborne radiological emissions in 2007 was much less than one-tenth of one percent of the EPA limit. The dose from combined airborne and waterborne radiological releases in 2007 to the same individual was less than one-tenth of one percent of the DOE limit.

On June 29, 2007, the DOE awarded a four year contract for management and operation of the WVDP to West Valley Environmental Services Company, LLC, a team led by Washington Group International. Transition to the new team was completed in 2007, ensuring the continuation of safely managed environmental cleanup and waste management activities.

If you have any questions or comments about the information in this report, please contact the WVDP Communications Department at (716) 942-2152 or complete and return the enclosed survey.

Sincerely,

Bryan C. Bower, Director
West Valley Demonstration Project

SUMMARY OF CHANGES TO THE 2007 WVDP ANNUAL SITE ENVIRONMENTAL REPORT FROM THE 2006 ANNUAL SITE ENVIRONMENTAL REPORT

This West Valley Demonstration Project (WVDP) Annual Site Environmental Report (ASER), prepared by the U.S. Department of Energy West Valley Demonstration Project office (DOE-WVDP), summarizes the environmental protection program at the WVDP for calendar year (CY) 2007. Monitoring and surveillance of the facilities used by the DOE are conducted to verify protection of public health and safety and the environment. This report is a key component of DOE's effort to keep the public informed of environmental conditions at the WVDP. The quality assurance protocols applied to the environmental monitoring program by the DOE ensure the validity and accuracy of the monitoring data.

SPECIAL ISSUES IN CY 2007

- In 2007, the DOE awarded a four-year contract for the management and operation at the WVDP. The contract was transitioned from West Valley Nuclear Services Company (WVNSCO) to West Valley Environmental Services, LLC (WVES) with work continuing uninterrupted. All permits, licenses, and agreements were transitioned as appropriate.

- Waste management, characterization, packaging, and shipping activities included; shipping the remaining cemented low-level waste drums from the Drum Cell, decontamination of select areas of the Main Plant Process Building (MPPB) including removal of additional waste, and removal of excess materials from the site for recycle, reuse, or disposal.

- Resulting from a "Corrective Measures Study" (CMS) and the issuance of a corrective measures work plan for select solid waste management units, an interim measure (IM) was implemented to improve the integrity of the U.S. Nuclear Regulatory Commission (NRC)-Licensed Disposal Area (NDA) earthen cap and to limit water infiltration. The IM included ensuring a minimum four-foot-thick earthen cap, installation of a geosynthetic cap over the NDA, a low-permeability subsurface groundwater cutoff wall (slurry wall) upgradient of the NDA, and surface water drainage diversions. Soil test borings were completed in late 2007, to determine the till interface conditions around the NDA. The field work for installation of the slurry wall and the geosynthetic cap were completed in the 2008 construction season.

Changes in content for the 2007 ASER are summarized below.

REVISIONS

- A table has been included in the Introduction that presents an overview of the historic timeline of significant legal directives, major activities, and accomplishments at the WNYNSC and the WVDP.

- The Environmental Compliance Summary was updated to reflect 2007 compliance status at the WVDP. A new table has been included describing the National Environmental Policy Act (NEPA) process at the WVDP and the NEPA documents affecting WVDP activities.

- Discussions of 2007 radiological and nonradiological monitoring (formerly addressed separately in chapters 2 and 3) are now covered in a single chapter (chapter 2). The data tables of curies released from the two primary water discharge locations and the primary air emission point have been included in chapter 2.

- The "wind roses" showing the wind patterns around the WVDP during 2007, and the annual precipitation data summary table (formerly in Appendix I) have been included in chapter 2.

- Dose assessment information (formerly presented in chapter 2) has been presented in its own chapter (chapter 3).

- Quality Assurance information formerly found in chapter 5 has been incorporated into chapter 1 “Environmental Management System” (EMS) to more appropriately be included with the EMS elements of audits, nonconformance and corrective actions, and preventative measures.

- Former appendices A (maps) and B (environmental monitoring program) have been combined into one (Appendix A) and the monitoring program discussion has been condensed.

- Data and text were updated throughout to reflect results from the CY 2007 environmental monitoring program. Data tables, graphs, maps, supplemental information sections, and references were updated.

- Consistent with previous years’ ASERs, and consistent with the “Guidance for the Preparation of the DOE ASERs”, noteworthy events or accomplishments that occurred in CY 2008 (up to the time of public distribution) have been included in this 2007 ASER.

- The environmental monitoring program was thoroughly evaluated at the end of CY 2007 and reductions to the program were made, to be implemented in 2008. Lists of the changes in 2007 are provided in the monitoring schedule in Appendix A. Also included is a listing of the changes implemented at the beginning of 2008. The maps in Appendix A, which include all the locations monitored in 2007, have been color-coded to show locations at which the monitoring program has remained the same, those locations at which sampling has been reduced, and those locations at which sampling has been discontinued. A presentation describing the 2008 WVDP environmental monitoring program, including a discussion of changes from 2007, was given by WVES to the West Valley Citizen Task Force (CTF) in February 2008.

West Valley Demonstration Project

Annual Site Environmental Report

for

Calendar Year 2007

Prepared for the U.S. Department of Energy

West Valley Demonstration Project Office

under contract DE-AC30-07CC30000

December 2008

West Valley Environmental Services LLC and URS - Washington Division

10282 Rock Springs Road

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Disclaimer

This report was prepared by the West Valley Environmental Services LLC (WVES) under contract number DE-AC30-07CC30000 with the United States of America, represented by the Department of Energy. Neither the United States Government nor WVES nor any of their contractors, subcontractors, or employees makes any warranty, expressed or implied, or assumes any legal liability or responsibility for any apparatus, product, or process disclosed, or represents that its use would not infringe on privately owned rights. References herein to any specific commercial product, process or service by trade name, trademark, manufacturer, or otherwise does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or WVES. This report contains a summary of major or significant activities occurring at the West Valley Demonstration Project (WVDP) only and is not a full disclosure of all details associated with WVDP-related activities. The views and opinions of authors expressed in this report may not specifically state or reflect those of the United States Government or any agency thereof.

Preface

Environmental monitoring at the West Valley Demonstration Project (WVDP) is conducted by West Valley Environmental Services LLC, under contract to the U.S. Department of Energy. The data collected provide a historical record of radionuclide and radiation levels and chemical data from natural and man-made sources in the survey area. The data also document the chemical and radiological quality of the groundwater on and around the WVDP and of the air and water released by the WVDP. Meteorological data are also presented.

It is the policy at the WVDP to conduct all activities, including design, construction, testing, start-up, commissioning, operation, maintenance, and decontamination and decommissioning, in a manner that is appropriate to the nature, scale, and environmental effects of these activities. The WVDP management is committed to full compliance with applicable federal, New York State, and local laws and regulations for the protection of the environment, to continual improvement, to the prevention and/or minimization of pollution, and to public outreach, including stakeholder involvement.

This report represents a single, comprehensive source of on-site and off-site data collected during 2007. The environmental monitoring program and results are discussed in the body of this report. Additional monitoring information is presented in the appendices. Appendix A contains maps of on-site and off-site sampling locations and a summary of the site environmental monitoring schedule. Appendices B through I can be found in electronic format on the compact disk (as indicated by the CD icon) located inside the back cover. Appendices B through H contain summaries of data obtained during 2007 and are intended for those readers interested in more detail than is provided in the main body of the report. Appendix I contains a copy of the West Valley Demonstration Project Act.

Requests for additional copies of the 2007 Annual Site Environmental Report and questions regarding the report should be referred to the WVDP Communications Department, 10282 Rock Springs Road, West Valley, New York 14171 (telephone: 716-942-2152). Additional Project information, including WVDP site environmental reports, is available on the internet at http://www.wv.doe.gov.

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TABLE OF CONTENTS

ENVIRONMENTAL COMPLIANCE SUMMARY *(concluded)*

CHAPTER 1 ***(concluded)***

CHAPTER 2 *(concluded)*

CHAPTER 4 *(concluded)*

List of Figures

List of Figures *(concluded)*

List of Tables

List of Tables *(concluded)*

TABLE OF CONTENTS FOR APPENDICES B THROUGH J (CD ONLY)

List of Figures

List of Tables

TABLE OF CONTENTS FOR APPENDICES B THROUGH J (CD ONLY) *(continued)*

List of Tables *(continued)*

TABLE OF CONTENTS FOR APPENDICES B THROUGH J (CD ONLY) *(continued)*

List of Tables *(continued)*

TABLE OF CONTENTS FOR APPENDICES B THROUGH J (CD ONLY) *(concluded)*

List of Tables *(continued)*

TABLE OF CONTENTS FOR APPENDICES B THROUGH J (CD ONLY) *(concluded)*

List of Tables *(concluded)*

EXECUTIVE SUMMARY

Purpose of This Report

The Annual Site Environmental Report (ASER) for the West Valley Demonstration Project (WVDP or Project) is published to provide information about environmental conditions at the WVDP to members of the public living near the site, to the United States (U.S.) Department of Energy (DOE) Headquarters, and to other interested stakeholders. In accordance with DOE Order 231.1A, "Environment, Safety, and Health Reporting," this report summarizes calendar year (CY) 2007 environmental monitoring data so as to describe the performance of the WVDP's environmental management system (EMS), confirm compliance with standards and regulations, and highlight important programs. Activities at the WVDP are being conducted in cooperation with the New York State Energy Research and Development Authority.

Major Site Programs

The WVDP is located on the site of a former commercial nuclear fuel reprocessing plant, which was shut down in 1976. In 1980, Public Law 96-368 (the WVDP Act) was passed, which authorized the DOE to demonstrate a method for solidifying 600,000 gallons (2.3 million liters) of liquid high-level radioactive waste (HLW) that remained at the West Valley site. Vitrification of the HLW, begun in 1996, was completed in September 2002. Activities for decontaminating and dismantling the facilities and for managing and disposing of wastes were then initiated and continued through CY 2007. The major activities that occurred in 2007 are described below.

Contractor Transition. On June 29, 2007, the DOE awarded a new four-year WVDP Interim End-State Contract for management operations at the WVDP to West Valley Environmental Services LLC (WVES). The previous contractor, West Valley Nuclear Services Company (WVNSCO), prepared and delivered detailed Project turnover documentation to the DOE to ensure a seamless transition to the new operator. WVNSCO/WVES interfaced during the transition period, from July 1 through August 31, to maintain a comprehensive program for ongoing and proposed operations. On September 1, 2007, WVES assumed management at the WVDP. All permits, licenses, and agreements were transitioned to WVES as appropriate. The scope of the new contract includes waste disposition, decontamination, deactivation, disposition of facilities, and infrastructure/landlord activities.

Waste Management and Shipment.

- Drum Cell Waste Shipped

  By the end of October 2007, the remainder of the approximately 20,000 half-ton drums of cemented Class C low-level waste (LLW) were removed from storage in the drum cell and shipped to the Nevada Test Site for disposal. These shipments accounted for approximately 241.5 thousand cubic feet (ft^3) (6.8 thousand cubic meters [m^3]) of shipped waste. The drum cell shipping campaign was expected to take 2.5 years when it began in mid-2006. Instead, process improvements and efficiencies allowed the work to be completed more than one year ahead of schedule and nearly 50% below the original cost estimate.

- Main Plant Process Building Decontamination and Waste Management

  Decontamination work was completed in the fuel receiving and storage area pump pit. Other waste processing and shipping activities included removing stored waste for processing and shipping for off-site disposal.

- Low-Level Waste

  A total of approximately 109 thousand ft^3 (3.09 thousand m^3) of LLW was processed, packaged, and shipped for disposal.

- South Plateau Hardstand Cleanup

  A concerted effort was made to remove excess materials from the south plateau. Stored waste was shipped for disposal, a leaded-glass window was returned to the manufacturer, a used fiberglass oil tank was transferred to a local town for waste oil storage, and two nonradioavtive used stainless-steel tanks were sent off site for recycling.

- Infrastructure Reduction

  Four additional structures (the test and storage building, maintenance shop, main 1 warehouse, and the schoolhouse), identified in DOE/EA-1552, were demolished and removed from the site. Combined with the 11 structures removed in 2006, 15 of the 36 structures scheduled for removal in DOE/EA-1552 have been demolished.

Key Initiatives

Environmental Performance Indicators. The WVDP has been recognized by the U.S. Environmental Protection Agency (EPA) as a charter member of the Performance Track (P-Track) Program for implementation of its EMS. In 2007, WVES renewed its application to the program by identifying four new performance goals for the WVDP. WVES, in conjunction with the DOE, submitted the P-Track annual performance report to the EPA in March 2008, for CY 2007, demonstrating the facility's progress toward its performance commitments and to maintain qualifications under the program. The commitments (to be met by the end of CY 2009 with CY 2006 as the baseline) and the 2007 annual reporting accomplishments were to reduce the following:

- total nontransportation energy usage by 5%: total energy usage was reduced by 15.6% in CY 2007;
- amount of liquid nitrogen used by 10%: liquid nitrogen usage was reduced by 45.3% in CY 2007;
- amount of resins used for the treatment of radiologically contaminated wastewater generated by plant operations by 10%: this goal is in the planning stages with engineering and design efforts complete in CY 2007 and planning for implementation in CY 2008; and
- amount of sulfur oxide (SO_x) air emissions from nontransportation purposes by 10%: SO_x emissions were reduced by 61.4% in CY 2007.

Pollution Prevention/Waste Minimization. In 2007, as part of the site's EMS, a long-term waste minimization and pollution prevention program to promote affirmative procurement and minimize the generation of LLW, mixed waste, hazardous waste, industrial waste, and sanitary waste continued at the WVDP. The program emphasized good business practices, source reduction, and recycling.

Environmental Management System

The WVDP EMS satisfies the requirements of DOE Order 450.1, "Environmental Protection Program." The WVDP EMS is a key part of the WVDP Integrated Safety Management System (ISMS). In 2007, WVDP employees continued to demonstrate their commitment to an all-inclusive approach to safety, coordinating the EMS with other safety management and work planning processes through the integrated environmental, health, and safety management program.

Compliance. Management at the WVDP continued to provide strong support for environmental compliance in 2007. Requirements and guidance from applicable state and federal statutes, executive orders, DOE orders, and standards are integrated into the Project's compliance program. In CY 2007:

- no notices of violation or inspection findings from any environmental regulatory agencies were received by the WVDP.
- inspections by the New York State Department of Environmental Conservation (NYSDEC) and the local department of health verified Project compliance with the applicable environmental and health regulations.
- waste management areas at the site were monitored in compliance with the Resource Conservation and Recovery Act (RCRA) §3008(h) Administrative Order on Consent.
- Project representatives met requirements of the Emergency Planning and Community Right-to-Know Act by collecting information about hazardous materials used at the Project and making this information available to the local community.
- no exceedances to State Pollutant Discharge Elimination System (SPDES) permit limits or to the EPA's National Emission Standards for Hazardous Air Pollutants (NESHAP) dose standard were noted in 2007.

Environmental Monitoring. As part of the EMS, environmental monitoring was continued on and near the site to detect and evaluate changes in the environment resulting from Project (or pre-Project) activities and to assess the effect of any such changes on the environment or human population. Within the environmental monitoring program, airborne and waterborne effluents were sampled and environmental surveillance of the site and nearby areas was conducted.

- Radiological Releases

  In 2007, the WVDP maintained six NESHAP permits for release of radiological airborne emissions. The primary controlled air emission point at the WVDP is the main plant ventilation stack.

  Waterborne releases were from two primary sources. In 2007, treated process water was released in six batches from lagoon 3, totaling approximately 10.8 million gallons (40.7 million liters). The other primary source is from a well-characterized seepage on the north plateau of the WVDP that is contaminated with strontium-90 from pre-WVDP operations. Radiological concentrations and flow from north plateau seepage were closely monitored.

- Estimated Dose

  In 2007, the estimated dose to a maximally exposed off-site individual (MEOSI) from airborne emissions at the WVDP was 0.0010 mrem (0.000010 mSv), about 0.01% of the 10-mrem NESHAP standard. Estimated dose from waterborne sources in 2007 was about 0.066 mrem (0.00066 mSv), with 0.012 mrem (0.00012 mSv) attributable to liquid effluent releases and 0.054 mrem (0.00054 mSv) attributable to the north plateau drainage.

  Total estimated dose to the MEOSI from both airborne and waterborne sources in 2007 was 0.067 mrem (0.00067 mSv), about 0.067% of the annual 100-mrem DOE standard. In comparison, the average dose to a member of the public from natural background sources is 295 mrem per year.

  Estimated dose to the population within a 50-mile (80-km) radius of the WVDP from DOE activities in 2007 was 0.33 person-rem (0.0033 person-Sv). This same population would have received approximately 453,000 person-rem from natural background radiation in 2007.

- Dose to Biota

  An evaluation of dose to biota for CY 2007, as part of the WVDP environmental monitoring program, resulted in the conclusion that populations of aquatic and terrestrial biota (both plants and animals) are not being exposed to doses in excess of the existing DOE dose standard for native aquatic animal organisms (1 rad/day) nor the recommended thresholds for terrestrial animals (0.1 rad/day) and plants (1 rad/day).

- Nonradiological Releases

  Nonradiological releases from Project wastewater and storm water monitoring points were measured under the site's SPDES permit. In 2007, no exceedances of any permit limits were noted.

Groundwater Monitoring and North Plateau Characterization. Monitoring of groundwater at the WVDP continued in 2007, including monitoring of strontium-90 activity in and around the groundwater plume on the north plateau. In late 2007, the DOE submitted to the NYSDEC a draft "Sampling and Analysis Plan for Characterization of the North Plateau Plume Area" and a draft "Sampling Plan for Background Subsurface Soil Data on the North Plateau." These investigative programs will be completed in 2008, and will provide information to further characterize and evaluate groundwater and soils in the north plateau strontium-90 plume area. The effort will enhance decision-making strategies for reducing the downgradient migration of the leading edge of the strontium-90 plume.

The Nuclear Regulatory Commission (NRC)-Licensed Disposal Area (NDA). An Interim Measure (IM) Workplan for the NDA was completed under the RCRA §3008(h) Administrative Order on Consent, with the stated goals being to improve the integrity of the earthen cap over the NDA and to limit water infiltration. The IM, which was started in 2007 and will be completed in 2008, includes the installation of a geosynthetic cap over the NDA, a low-permeability subsurface groundwater cut-off (slurry wall) upgradient of the NDA, and surface water drainage diversions.

Quality Assurance. In 2007, implementation of a quality assurance program for activities supporting the environmental monitoring and groundwater monitoring programs continued at the WVDP. As part of this ongoing effort, on-site and subcontract laboratories that analyze WVDP environmental samples participated in independent radiological and nonradiological constituent performance evaluation studies. In these studies, test environmental samples with concentrations known by the testing agency, but unknown by the laboratory, were analyzed. Of almost

170 performance evaluation analyses conducted by or for the WVDP, 98.7% fell within acceptance limits.

Several inspections, audits, and assessments of components of the environmental monitoring program were conducted in 2007. Although actions were recommended to improve the program, nothing was found that would compromise the data quality in this report or the environmental monitoring program in general.

Conclusion

In addition to demonstrating compliance with environmental regulations and directives, evaluation of data collected in 2007 continued to indicate that WVDP activities pose no threat to public health or safety, or to the environment.

INTRODUCTION

Site Location

The West Valley Demonstration Project (WVDP or Project) is located in western New York State, about 30 miles (50 kilometers [km]) south of Buffalo, New York (Fig. INT-1). The WVDP facilities occupy a security-fenced area of about 167 acres (68 hectares [ha]) within the 3,338-acre (1,351 ha) Western New York Nuclear Service Center (WNYNSC) located primarily in the town of Ashford in northern Cattaraugus County. The security-fenced area is specifically referred to as the Project premises.

General Environmental Setting

Climate. Although extremes of 98.6^{o}F (37^{o}C) and -43.6^{o}F (-42^{o}C) have been recorded in western New York, the climate is moderate, with an average annual temperature (1971–2000) of 48^{o}F (8.9^{o}C). Precipitation is markedly influenced by Lake Erie to the west and, to a lesser extent, by Lake Ontario to the north. Regional winds are generally from the west and south at about 9 miles per hour (4 meters/second).

Ecology. The WNYNSC lies within the northern deciduous forest biome, and the diversity of its vegetation is typical of the region. Equally divided between forest and open land, the site provides a habitat especially attractive to white-tailed deer and various indigenous migratory birds, reptiles, and small mammals. No species on the federal endangered species list are known to reside on the WNYNSC.

Geology and Hydrology. The Project lies on New York State's Allegheny Plateau at an average elevation of about 1,300 feet (400 meters). The underlying geology includes a sequence of glacial sediments above shale bedrock. The Project is drained by three small streams (Franks Creek, Quarry Creek, and Erdman Brook) and is divided by a stream valley (Erdman Brook) into two general areas: the north plateau and the south plateau.

Franks Creek, which receives drainage from Erdman Brook and Quarry Creek, flows into Buttermilk Creek, which enters Cattaraugus Creek and leaves the WNYNSC. (See Figs. A-1 and A-5.) Cattaraugus Creek ultimately drains into Lake Erie, to the northwest.

Relevant Demographics

Although several roads and a railway approach or pass through the WNYNSC, the public is prohibited from accessing the WNYNSC. A limited public deer hunting program managed by the New York State Energy Research and Development Authority (NYSERDA) is conducted on a year-to-year basis in designated areas on the WNYNSC. No public access is allowed on the WVDP Project premises.

Land near the WNYNSC is used primarily for agriculture and arboriculture. Downstream of the WNYNSC, Cattaraugus Creek is used locally for swimming, canoeing, and fishing. Although some water is taken from the creek to irrigate nearby golf course greens and tree farms, no public drinking water is drawn from the creek before it flows into Lake Erie. Water from Lake Erie is used as a public drinking water supply.

The communities of West Valley, Riceville, Ashford Hollow, and the village of Springville are located within approximately 5 miles (8 km) of the Project. The nearby population, approximately 9,200 residents within 6.2 miles (10 km) of the Project, relies largely on an agricultural economy. No major industries are located within this area. The WVDP is one of the largest employers in Cattaraugus County.

Historic Timeline of the WNYNSC and the WVDP

The following summary, presented in Table INT-1, depicts a historic timeline for the WNYNSC and the WVDP beginning with the establishment of the WNYNSC as a commercial nuclear fuel reprocessing facility, to the creation of the WVDP, to the current Project mission. The summary includes significant legal directives, major activities and accomplishments.

A reader opinion survey has been inserted in this report. If it is missing, please contact the WVDP Communications Department at (716) 942-2152. Additional Project information is available on the internet at http://www.wv.doe.gov.

FIGURE INT-1
Location of the Western New York Nuclear Service Center

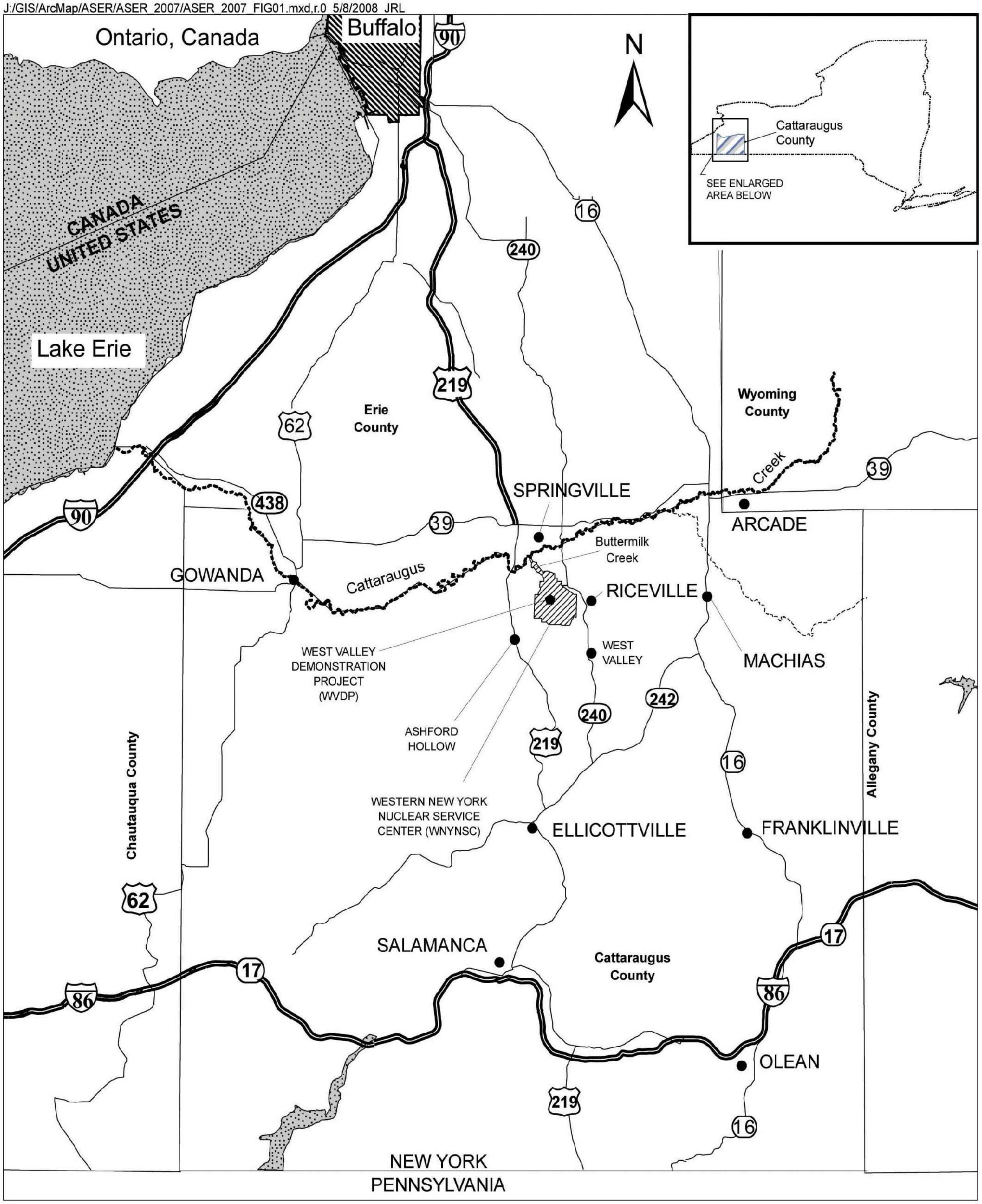

TABLE INT-1
Historic Timeline of the WNYNSC and the WVDP

Year	Activity
1954	The Federal Atomic Energy Act promoted commercialization of reprocessing spent nuclear fuel.
1959	New York State (NYS) established the Office of Atomic Development (OAD) to coordinate the atomic industry.
1961	The NYS OAD acquired 3,345 acres (1,332 hectares) of land in Cattaraugus County, Town of Ashford (near West Valley), in Western New York and established the Western New York Nuclear Service Center (WNYNSC).
1962	Davidson Chemical Company established Nuclear Fuels Services, Inc. (NFS) as a nuclear fuel reprocessing company, and reached an agreement with NYS to lease the WNYNSC (also referred to as "the Center").
1966	NFS constructed and operated the commercial nuclear fuel reprocessing facility at the WNYNSC from 1966 to 1972. NFS processed 640 metric tons of spent reactor fuel at the facility, generating 660,000 gallons (2.5 million liters) of highly radioactive liquid waste. NFS operated a 5-acre landfill, the "U.S. Nuclear Regulatory Commission (NRC)-Licensed Disposal Area (NDA)" for disposal of waste generated from the reprocessing operations. In addition, a 15-acre commercial disposal area, the "State Licensed Disposal Area (SDA)" regulated by NYS agencies, under delegation of authority from the NRC, accepted low-level radioactive waste (LLW) from operations at the Center and from off-site facilities from 1963 until 1975.
1972	In 1972, while the plant was closed for modifications, more rigorous regulatory requirements were imposed upon fuel reprocessing facilities. NFS determined the costs to meet regulatory requirements of spent nuclear fuel reprocessing were not economically feasible. NFS notified the New York State Energy Research and Development Authority (NYSERDA) in 1976 that they would discontinue reprocessing and would not renew the lease that would expire at the end of 1980.
1975	Water infiltrated into the SDA trenches and waste burial operations ceased. Between 1975 and 1981, NFS pumped, treated, and released liquids to the adjacent stream. Redesigning the covers reduced, but did not eliminate, water accumulation in the trenches.
1980	Before discontinuing fuel reprocessing operations in 1975, NFS had accepted 750 spent fuel assemblies which remained in storage in the on-site Fuel Receiving and Storage (FRS) Area. In 1980, 625 of those assemblies were returned to the utilities that owned them.
1980	The U.S. Congress passed Public Law 96-368, the West Valley Demonstration Project Act (WVDP Act), requiring the Department of Energy (DOE) to be responsible for solidifying the liquid high-level waste (HLW) stored in underground tanks, disposing of the waste created by solidification, and decontaminating and decommissioning the facilities used during the process.
1980	Per the WVDP Act, the DOE entered into a Cooperative Agreement with NYSERDA that established the framework for cooperative implementation of the WVDP Act. Under the agreement, the DOE has exclusive use and possession of a portion of the Center known as the Project Premises (approximately 167 acres). A supplement to the Cooperative Agreement (1981 amendment) between the two agencies set forth special provisions for the preparation of a joint Environmental Impact Statement (EIS).
1981	The DOE and the NRC entered into a Memorandum of Understanding that established specific agency responsibilities and arrangements for informal review and consultation by the NRC. Since NYSERDA holds the license and title to the West Valley site, the NRC put the technical specifications of the license (CSF-1) in abeyance to allow the DOE to carry out the responsibilities of the WVDP Act.
1982	West Valley Nuclear Services (WVNS), a Westinghouse subsidiary, was chosen by the DOE to be the management and operating (M&O) contractor. WVNS commenced operations at the WVDP on February 28, 1982.
1983	In 1983, NYSERDA assumed management responsibility for the SDA and focused efforts to minimize infiltration of water into the trenches. In the 1990s, installation of a geomembrane cover over the entire SDA and a belowground barrier wall were successful in eliminating increases in trench water levels.
1983	The DOE selected the vitrification (VIT) process as the preferred method for solidifying the HLW into glass.
1984	Nonradioactive testing of a full-scale vitrification system was conducted from 1984–1989.
1984	NFS entered into an agreement with the DOE in which the DOE assumed ownership of the remaining 125 fuel assemblies in the FRS Pool and the responsibility for their removal.

TABLE INT-1 *(continued)*
Historic Timeline of the WNYNSC and the WVDP

Year	*Activity*
1986	A large volume of radioactive waste, non-HLW, would result from WVDP activities. Disposal of most of this waste was evaluated in an Environmental Assessment (DOE/EA-0295, April 1986), and a finding of no significant impact was issued. Consistent with a settlement agreement, the DOE temporarily stored the waste on site until disposal alternatives are determined under subsequent EISs.
1987	A decision to potentially dispose of LLW at the Project led to a legal disagreement between the DOE and the Coalition on West Valley Nuclear Wastes and the Radioactive Waste Campaign. It was resolved by a Stipulation of Compromise which states that LLW disposal at the site and the potential effects of erosion at the site must be included in a comprehensive EIS.
1988	In December 1988, the DOE and NYSERDA issued a Notice of Intent in the Federal Register to prepare an EIS in accordance with Section 102(2)(C) of the National Environmental Policy Act (NEPA) and Section 8-0109 of the New York State Environmental Quality Review Act (SEQR).
1988	To prepare for VIT, the Integrated Radwaste Treatment System was constructed to process the liquid supernatant from the underground HLW tanks by removing most of the radioactivity in the supernatant, concentrating the liquid, and blending it with cement. The HLW sludge layer was then treated by washing to remove soluble salts. The water containing the salts was also stabilized into cement. About 20,000 drums of cement-stabilized LLW were stored in the aboveground Drum Cell. The process was completed in 1995.
1990	Organic solvent waste was observed in a groundwater monitoring well immediately downgradient of the NDA in 1983. Following characterization of the area, an interceptor trench bordering the northeast and northwest boundaries of the NDA and a liquid pretreatment system (LPS) were built in 1990–1991. The trench was designed to collect liquid that might migrate from the NDA and the LPS was designed to recover free organic product (if any) from the recovered liquid. To date, no organic product has been detected in the interceptor trench water; therefore, the water has been pumped and treated through the LLW treatment system.
1991	The NYS Department of Environmental Conservation (NYSDEC) was authorized by the Environmental Protection Agency (EPA) to administer the Resource Conservation and Recovery Act (RCRA) hazardous waste program, specifically hazardous mixed wastes. In 1991, a RCRA Part A Permit Application for the WVDP was filed with NYSDEC for storage and treatment of hazardous and mixed wastes.
1992	In 1992, the DOE and NYSERDA entered into a RCRA §3008(h) Administrative Order on Consent (Consent Order) with NYSDEC and the EPA. The Consent Order pertained to management of hazardous waste and/or hazardous constituents from solid waste management units at the WVDP. It also required the DOE and NYSERDA to perform a RCRA Facility Investigation at the WNYNSC to determine if there had been a release or if there was a potential for a release of RCRA hazardous constituents.
1993	In 1993, gross beta activity in excess of 1.0E-06 µCi/mL (the applicable DOE Derived Concentration Guide for strontium-90 [Sr-90]) was detected in surface water on the north plateau, in the vicinity of sampling location WNSWAMP. The gross beta radioactivity was determined to be Sr-90.
1994	Extensive subsurface investigations delineated the extent of the Sr-90 plume and determined that the plume originated beneath the southwest corner of the Main Plant Process Building (MPPB) during NFS operations and migrated toward the northeast quadrant of the north plateau. A second lobe of contamination was attributed to the area of former lagoon 1, which was backfilled in 1984.
1995	In 1995, a groundwater recovery system consisting of three wells was installed on the north plateau to extract and treat the Sr-90-contaminated groundwater to minimize plume advancement. In 1999, a pilot-scale permeable treatment wall was constructed to test this passive in-situ remediation technology.
1995	The Vitrification Building shielding was installed in 1991, the slurry-fed ceramic melter was assembled in 1993, and the remaining major components were installed and tested by the end of 1994. In 1995, the Vitrification Facility was completed, fully tested, and "cold operations" began.
1996	The DOE and NYSERDA issued a Draft Environmental Impact Statement (DEIS) for Completion of the WVDP and Closure or Long-Term Management of the WNYNSC. After issuance of the DEIS, the Citizen Task Force was convened to provide additional stakeholder input regarding the WVDP/WNYNSC closure process.

TABLE INT-1 *(concluded)*
Historic Timeline of the WNYNSC and the WVDP

Year	*Activity*
1996	Vitrification operations began in 1996 and continued into 2001, producing a total of 275 10-foot-tall stainless-steel canisters of hardened radioactive glass containing more than 12.2 million cesium/strontium curies. The glass melter was shut down in September 2002.
1996	NYSDEC and the DOE entered into an Order on Consent negotiated under the Federal Facilities Compliance Act for handling, storage, and treatment of mixed wastes at the WVDP.
1996	The Seneca Nation of Indians Cooperative Agreement was signed in 1996 to foster government-to-government relationships between the Seneca Nation and the U.S. government as represented by the DOE.
1999	Vitrification Expended Materials Processing was initiated to begin processing unserviceable equipment from the VIT process. This success helped in developing a Remote-Handled Waste Facility (RHWF) to process large-scale, highly contaminated equipment excessed during decontamination and decommissioning activities.
2000	Restructuring of the work force began. Construction of the RHWF began.
2001	The 125 spent fuel assemblies that remained in storage at the WVDP since 1975 were prepared for transport to the Idaho National Engineering and Environmental Laboratory (INEEL). Two significantly contaminated areas in the MPPB, the process mechanical cell and the general purpose cell, were decontaminated.
2001	The DOE published formal notice in the Federal Register (66 FR 16447) to split the EIS process into (1) the WVDP Waste Management EIS, and (2) the Decommissioning and/or Long-Term Stewardship EIS at the WVDP and the WNYNSC.
2002	The NRC issued "Decommissioning Criteria for the West Valley Demonstration Project (M-32) at the West Valley Site; Final Policy Statement" (67 FR 5003).
2003	The remaining 125 spent fuel assemblies were shipped to Idaho National Engineering and Environmental Laboratory, allowing for decontamination of the FRS to begin.
2004	The RHWF became operational. Major decontamination efforts continued and more than 104,000 cubic feet of LLW were safely shipped for off-site disposal. Footprint reduction began as 20 office trailers were removed. The 6 NYCRR RCRA Part 373-2 Permit Application was submitted to NYSDEC.
2005	In June 2005, the DOE published its final decision on the "WVDP Waste Management Environmental Impact Statement (68 FR 26587)." The DOE implemented the preferred alternative for the management of WVDP LLW and mixed LLW. The decision on transuranic waste was deferred, and the HLW canisters will remain in on-site storage until shipped to a repository.
2005	In November 2005, the WVDP was downgraded to a Category 3 nuclear facility, marking the first time in the site's history that it has been designated the least of the three DOE nuclear facility designations. The categorization is based on amounts, types, and configuration of the nuclear materials stored and their potential risks. Site footprint reduction activities escalated and more than 300,000 cubic feet of LLW were shipped off site for disposal.
2006	An Environmental Assessment (DOE/EA-1552) evaluating the proposed decontamination, demolition, and removal of 36 facilities was issued. Eleven of the 36 structures were removed by the end of 2006, and about 400,000 cubic feet of various waste types were shipped offsite for disposal.
2006	The DOE-WVDP office initiated a collaborative, consensus-based team process, referred to as the "Core Team," that involves NYSERDA, the EPA, the New York State Department of Health, the NRC, and NYSDEC. This team brings individuals with decision-making authority together to resolve challenging issues surrounding the WVDP EIS process and to make recommendations to move the Project toward an "Interim End-State" prior to issuance of the "Final EIS for the Decommissioning and/or Long-Term Stewardship at the WVDP and the WNYNSC."
2007	Demolition and removal of four more structures identified under the DOE/EA-1552 was completed. On June 29, 2007, West Valley Environmental Services LLC was awarded a four-year contract, by the DOE, to conduct the next phase of cleanup operations at the WVDP under Contract DE-AC30-07CC30000. The remaining drums of cemented LLW in the Drum Cell were packaged and shipped to the Nevada Test Site for disposal.
2007	An interim measure to minimize water infiltration into the NDA was initiated. Site surveys and core borings were completed by late 2007, with scheduled 2008 construction of a slurry wall and installation of a geomembrane cap over the NDA.

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ENVIRONMENTAL COMPLIANCE SUMMARY

Compliance Program

The United States (U.S.) Department of Energy (DOE) is currently focusing on several goals at the West Valley Demonstration Project (WVDP or Project) to support completion of the requirements identified in the WVDP Act (Public Law 96-368).

Activities at the WVDP are regulated by various federal and state public, worker, and environmental protection laws. These laws are administered primarily by the U.S. Environmental Protection Agency (EPA), the U.S. Fish and Wildlife Service, the U.S. Army Corps of Engineers (USACE), the New York State Department of Environmental Conservation (NYSDEC), and the New York State Department of Health (NYSDOH) through programs and regulatory requirements for permitting, reporting, inspecting, self-monitoring, and auditing.

The EPA, NYSDEC, and DOE have established standards for effluents that are intended to protect human health, safety, and the environment. The DOE applies to the EPA for permits to release limited amounts of radiological constituents to the air and applies to NYSDEC for permits to release limited amounts of nonradiological constituents to the air and water, in concentrations determined to be safe for humans and the environment. In general, the permits describe release points, specify management and reporting requirements, list discharge limits on those pollutants likely to be present, and define the sampling and analysis regimen. Releases of radiological constituents in water are subject to the requirements in DOE Orders 450.1 (Environmental Protection Program) and 5400.5 (Radiation Protection of the Public and the Environment). A summary of permits is found in Table ECS-3. (See the compliance tables at the end of this chapter.) No releases above allowable permit or regulatory limits occurred in 2007.

Compliance Status

The following summary describes the WVDP's compliance status with applicable environmental statutes, DOE directives, executive orders, and state laws and regulations applicable to the Project activities.

TABLE ECS-1
Compliance Status Summary for the WVDP in CY 2007

Citation	*Environmental Statute, DOE Directive, Executive Order, Agreement*	*WVDP Compliance Status*
42 United States Code (USC) §2011 *et seq* .	The **Atomic Energy Act (AEA**) of 1954 was enacted to assure the proper management of source, special nuclear, and by-product materials. The AEA and the statutes that amended it delegate the control of nuclear energy primarily to the Department of Energy (DOE), the Nuclear Regulatory Commission (NRC), and the Environmental Protection Agency (EPA).	See discussions of the West Valley Demonstration Project (WVDP) Act and of DOE Orders 435.1, 450.1, and 5400.5.
Public Law 96-368	The **WVDP ACT** of 1980 authorized the DOE to carry out a high-level liquid nuclear waste demonstration project at the Western New York Nuclear Service Center (WNYNSC [the Center]) in West Valley, New York.	The DOE is focusing on goals that will lead to completion of responsibilities listed in the WVDP Act.

TABLE ECS-1 *(continued)*
Compliance Status Summary for the WVDP in CY 2007

Citation	*Environmental Statute, DOE Directive, Executive Order, Agreement*	*WVDP Compliance Status*
Cooperative Agreement between the DOE and the New York State Energy Research Development Authority (NYSERDA)	The **Cooperative Agreement Between the DOE and NYSERDA on the WNYNSC** established a cooperative framework for implementation of the Project, effective October 1980, as amended in September 1981.	The agreement arranged lease of the Project premises to the DOE in order to carry out responsibilities under the WVDP Act. The supplemental agreement defined special provisions for the preparation of a joint Environmental Impact Statement (EIS).
WVDP Memorandum of Understanding (MOU) between the DOE and the NRC	The 1981 **MOU**, mandated by the WVDP Act, established procedures for review and consultation by the NRC with respect to activities conducted at the WNYNSC by the DOE under the WVDP Act. The agreement encompassed development, design, construction, operation, and decontamination and decommissioning activities associated with the project as described in the WVDP Act.	The NRC was authorized through the WVDP Act to prescribe decommissioning criteria for the WVDP. In 2002, the NRC issued "Decommissioning Criteria for the WVDP (M-32) at the West Valley Site; Final Policy Statement" (67 FR 5003). The NRC visits the WVDP periodically to ensure that activities are performed in accordance with requirements of established programs.
DOE Order 231.1A	DOE O 231.1A, **Environment, Safety, and Health Reporting,** was issued to ensure timely collection, reporting, analysis, and dissemination of information on environment, safety, and health issues as required by law or regulations or as needed to ensure that the DOE and National Nuclear Security Administration are kept fully updated about events that could adversely affect the health and safety of the public or the workers, the environment, the intended purpose of DOE facilities, or the DOE's credibility.	This WVDP Annual Site Environmental Report (ASER) is prepared and submitted annually to DOE Headquarters, regulatory agencies, and interested stakeholders in compliance with DOE O 231.1A.
DOE Order 5400.5	DOE Order 5400.5, **Radiation Protection of the Public and the Environment**, established standards for DOE operations and DOE contractors to ensure that (1) operations are conducted to limit radiation exposure to members of the public pursuant to limits established in the Order, (2) potential exposures to members of the public are as low as reasonably achievable, (3) routine and nonroutine releases are monitored and dose to the public is addressed, and (4) the environment is protected from radioactive contamination to the extent practicable.	This ASER summarizes radiological estimates of dose to the public and the environment, and compares these values with release and dose standards established by this Order. In 2007, estimated doses from airborne and waterborne releases to the maximally exposed off-site individual (MEOSI) were 0.067% of the 100-mrem standard, and about 0.02% of natural background radiation. Refer to Chapter 3 "Dose Assessment" for further discussion.
DOE Order 435.1	DOE O 435.1, **Radioactive Waste Management**, was issued in 1999 to ensure that all DOE radioactive waste is managed in a manner that protects the public, the environment and workers, and complies with applicable state, federal and local laws and regulations. Under the Order, sites that manage radioactive waste are required to develop, document, implement, and maintain a site-wide radioactive waste management program which includes actions to minimize radioactive waste generation.	The WVDP maintains program documentation separately for each waste type. Management of high-level waste was conducted in accordance with the "WVDP Waste Acceptance Manual"; Transuranic (TRU) waste was managed in accordance with the "TRU Waste Management Program Plan"; low-level waste (LLW) was managed in accordance with the "LLW Management Program Plan"; and the radioactive component of mixed LLW was managed in accordance with the "Site Treatment Plan (STP) Fiscal Year 2007 Update".

TABLE ECS-1 *(continued)*
Compliance Status Summary for the WVDP in CY 2007

Citation	***Environmental Statute, DOE Directive, Executive Order, Agreement***	***WVDP Compliance Status***
DOE Order 450.1	DOE Order 450.1, **Environmental Protection Program,** issued in January 2003, required implementing an environmental management system (EMS) to conduct work at DOE sites to protect air, water, land, and other natural and cultural resources impacted by DOE operations. The DOE is required to conduct environmental effluent and surveillance monitoring to support the WVDP's Integrated Safety Management System (ISMS), to ensure early identification of, and appropriate response to, potential adverse environmental impacts associated with operations.	Since 1999, an EMS has been implemented via policies and procedures that provide an integrated site safety management program to accomplish work through proactive management, environmental stewardship, and integrating appropriate technologies across all Project functions. The EMS is an important part of the ISMS at the WVDP. During the annual ISMS review in September 2007, DOE concluded that ISMS mechanisms continued to be effective during contract transition to West Valley Environmental Services, LLC (WVES). Refer to Chapter 1 "Environmental Management System" for further discussion.
Title 10 Code of Federal Regulations (10 CFR) Part 830, Subpart A	10 CFR Part 830, **Nuclear Safety Management**, Subpart A, **Quality Assurance Requirements** provides the quality assurance (QA) program policies and requirements applicable to activities at the WVDP.	A QA program that provides a consistent system for collecting, assessing, and documenting data pertaining to radionuclides in the environment is implemented at the WVDP.
42 USC §4321 *et seq.*	The **National Environmental Policy Act (NEPA)**, of 1969 and as amended in 1970, established a national policy to ensure that protection of the environment is included in federal planning and decision-making. The President's Council on Environmental Quality established a screening system of analyses and documentation that requires each proposed action to be categorized according to the extent of its potential environmental impact.	DOE-WVDP has prepared various documents which describe potential environmental effects associated with proposed site activities. The level of documentation depends upon whether the action constitutes a major federal action affecting the quality of the human environment within the meaning of NEPA. Draft documents are then issued for public comment. Based on the analyses presented, and considering regulatory agency and public input, the DOE will determine the preferred alternative and issue a record of decision regarding the action. Refer to text later in this chapter for further discussion of NEPA activities.
Title 6 of the Official Compilation of Codes, Rules, and Regulations of the State of New York (6 NYCRR) Part 617 New York State (NYS) Environmental Conservation Law (ECL)	The **NYS Environmental Quality Review (SEQR) Act**, enacted in September 1976, requires adequate environmental review and assessment of whether a proposed action has the potential to have a significant environmental impact, prior to a decision regarding the action. Where a project involves both NYS and Federal approvals, it is preferred to coordinate the SEQR and NEPA processes.	The SEQR process is an action-forcing statute that requires state agencies to incorporate environmental considerations directly into their decision-making, and where necessary, to modify that action to mitigate adverse environmental effects. Although the NEPA Federal procedural statute requires documentation of the decision-making process, it does not require that environmental considerations be elevated above other factors. Efforts are being made at the WVDP to effectively coordinate information to utilize the Federal EIS process to make the required SEQR findings.
42 USC §6901 *et seq* . NYS ECL	The **Resource Conservation and Recovery Act (RCRA)** of 1976 and the **NYS Solid Waste Disposal Act** (NYS ECL Article 27 [Title 9]) govern the generation, storage, handling, and disposal of hazardous wastes and closure of tank systems that handle these wastes. RCRA was enacted to ensure that hazardous wastes are managed in a way that protects human health, safety, and the environment.	Generation, storage, handling, and disposal of hazardous waste, and closure of tank systems that handle hazardous waste at the WVDP, are conducted in accordance with the RCRA Part A Permit Application. Refer later in this chapter for a detailed discussion of calendar year (CY) 2007 activities.

TABLE ECS-1 *(continued)*
Compliance Status Summary for the WVDP in CY 2007

Citation	*Environmental Statute, DOE Directive, Executive Order, Agreement*	*WVDP Compliance Status*
Amendment to 42 USC §6961	The **Federal Facilities Compliance Act (FFCA)** of 1992 (an amendment to RCRA) requires DOE facilities to prepare an STP for treating mixed waste inventories to meet land disposal restrictions and to update the plan (i.e., annually) to account for changes in mixed waste inventories, capacities, and treatment technologies. The DOE entered into a Consent Order with the New York State Department of Environmental Conservation (NYSDEC) for the WVDP in 1996.	The WVDP STP consists of two volumes, the background volume and the plan volume. The FFCA requires completing milestones identified in the plan volume. During fiscal year (FY) 2007, there were no milestones or proposed milestones for waste streams managed under the WVDP STP. There were no mixed waste shipments from the WVDP in FY 2007. The STP was revised in February 2008.
Docket No. II RCRA 3008(h) 92-0202	The DOE and NYSERDA entered into a **RCRA §3008(h) Administrative Order on Consent** (the Consent Order) with NYSDEC and the EPA in March 1992. The Consent Order pertains to management of hazardous waste and/or hazardous constituents from solid waste management units at the WNYNSC.	Written procedures and site activities are compliant with the Consent Order. In accordance with the Consent Order, quarterly reports are submitted to NYSDEC from DOE which summarize all RCRA §3008(h) activities conducted at the WVDP for the representative quarter. Refer later in this chapter for a detailed discussion of CY 2007 activities.
RCRA 3016 Statute	The **RCRA 3016 Statute** applies to all Federal hazardous waste facilities which are currently owned or operated by the government. It requires that facility hazardous waste information be submitted to the EPA and authorized states.	Contract # DE-AC30-07CC30000, Section J, Item 11 requires that WVDP facility hazardous waste activities be reported biennially to NYSDEC. This report was submitted in December 2007.
NYS Navigation Law and NYS ECL	**NYS ECL** Article 17, (Titles 10 and 17) 6 NYCRR 612-614 and Parts 595-599, and 6 NYCRR Subpart 360-14 regulate design, operation, inspection, maintenance, and closure of aboveground and underground bulk petroleum and bulk chemical storage tanks. They also regulate spill reporting and cleanup. Under terms of a 1996 agreement, amended in 2005, the DOE is not required to report a spill of petroleum product onto an impervious surface if the spill is less than 5 gallons and is cleaned up within two hours of discovery.	The last chemical bulk storage tank at the WVDP was closed under these regulations in 2006. There remain 10 registered petroleum bulk storage tanks (nine aboveground and one underground) that are periodically inspected and maintained. Spills are reported and cleaned up in accordance with written policies and procedures. In 2007 there were no spills in excess of the reportable quantities.
Executive Order (E.O.) 13423	E.O. 13423, **Strengthening Federal Environmental, Energy, and Transportation Management**, issued in January 2007, replaced several executive orders known as the Greening the Government Executive Orders (E.O. 13101 and E.O. 13148). The Order did not rescind any of the requirements found in the earlier orders, but updated previous goals and their baselines and added new initiatives. The Order set goals in areas of energy efficiency, renewable energy, acquisition, toxics reduction, recycling, sustainable buildings, electronics stewardship, and water conservation.	Waste minimization, pollution prevention, recycling, and affirmative procurement objectives are achieved in accordance with the WVDP "Waste Minimization/Pollution Prevention Awareness Plan." (See Tables ECS-6 and ECS-7.) The WVDP renewed the EPA National Environmental Performance Track Program membership in 2007, and has committed to four new goals to reduce the following; (1) total non-transportation energy by 5%, (2) liquid nitrogen use by 10%, (3) resins used for treatment of radiologically contaminated wastewater by 10%, and (4) sulfur oxide (SO_x) air emissions from non-transportation purposes by 10%. The goals are to meet or exceed these commitments by the end of 2009, compared with 2006 as the baseline.

TABLE ECS-1 *(continued)*
Compliance Status Summary for the WVDP in CY 2007

Citation	***Environmental Statute, DOE Directive, Executive Order, Agreement***	***WVDP Compliance Status***
42 USC §7401 et seq.; Title 40 of the Code of Federal Regulations (CFR) 61, Subpart H; 6 NYCRR	The **Clean Air Act** of 1970 and the **NYS ECL** regulate the release of air pollutants through permits and air quality limits. Emissions of radionuclides are regulated by the EPA via the **National Emission Standards for Hazardous Air Pollutants (NESHAP)** regulations. Nonradiological emissions are permitted under 6 NYCRR Part 201-4 (Minor Facility Registrations).	During CY 2007, the DOE maintained six NESHAP permits for radiological emissions and one Air Facility Registration Certificate for nonradiological emissions at the WVDP. An annual NESHAP Report summarizing radiological emissions and estimating dose is submitted to the EPA. Estimated dose from radiological air emissions to the MEOSI in 2007 was 0.010% of the 10-millirem Subpart H standard. Refer to Chapter 3 "Dose Assessment" for discussion. Two utility steam boilers were responsible for nonradiological emissions of nitrogen oxides at 3.6% and sulfur oxides at 0.0013% of the capping limit for maintaining the registration certificate.
33 USC §1251 *et seq.* and NYS ECL	The **Federal Water Pollution Control Act** of 1977 (**Clean Water Act [CWA])** and **NYS ECL** (Article 17 [Title 8]) seek to improve surface water quality by establishing standards and a system of permits. Wastewater and storm water discharges are regulated by NYSDEC permits through the State Pollutant Discharge Elimination System (SPDES). Discharges of fill material are regulated through permits issued by the U.S. Army Corps of Engineers (USACE) and water quality certifications issued by NYSDEC.	Monthly SPDES Discharge Monitoring Reports are submitted to NYSDEC. In 2007, no SPDES Permit exceedences were noted. Compliance with permit requirements was confirmed by a NYSDEC annual inspection that included facility walk downs of the NRC-Licensed Disposal Area, select storm water outfalls, the sewage treatment plant, and the Lagoon 3 discharge weir, along with operational discussions. No findings or concerns were indicated. SPDES-permitted storm water monitoring was successfully completed during 2007 by sampling the eight drainage basins during qualifying storm events. Refer to Chapter 2 "Environmental Monitoring" for further discussion.
E.O. 11990	E.O. 11990, **Protection of Wetlands**, directed federal agencies to avoid, where possible, impacts (e.g., destruction, modification, or new construction) that would adversely effect wetlands wherever there is a practical alternative. Activities in wetlands are regulated by the USACE and NYSDEC permits. The wetlands on the WVDP are subject to regulation under section 404 of the CWA.	Wetlands are periodically identified, delineated, and mapped on the WVDP. In 2006, the USACE performed a field assessment of a wetland delineation report and confirmed that 34.09 acres of wetlands, subject to federal jurisdiction, exist within and adjacent to the WVDP. A wetland complex of 17.3 acres is subject to NYSDEC jurisdiction. During 2006–2007, a re-delineation was done to determine if any portion of the Live-Fire Range (LFR) on the WNYNSC property fell within a 100-foot buffer of any adjacent wetlands and to locate a new storm water outfall in the basin area. Adjacent to the LFR, a new wetland of 0.09 acres was identified that is hydrologically connected to the NYSDEC jurisdictional wetlands.
42 USC §9601 *et seq.*	The **Comprehensive Environmental Response, Compensation, and Liability Act** of 1980 **(CERCLA**, including the **Superfund Amendments and Reauthorization Act** of 1986 **[SARA]**) provided the regulatory framework for remediation of releases of hazardous substances and remediation of inactive hazardous waste disposal sites.	Based on the results of a Preliminary Assessment Report prepared for the DOE, it was determined that the WVDP did not qualify for listing on the national priorities list. Therefore, no further investigation pursuant to CERCLA was warranted. However, if a hazardous substance spill exceeds a reportable quantity, CERCLA reporting requirements may be triggered.

TABLE ECS-1 *(continued)*
Compliance Status Summary for the WVDP in CY 2007

Citation	*Environmental Statute, DOE Directive, Executive Order, Agreement*	*WVDP Compliance Status*
42 USC §11001 et seq.	The **Emergency Planning and Community Right-to-Know Act (EPCRA)** of 1986 (also known as SARA Title III) was designed to create a working partnership between industry, business, state and local government, and emergency response representatives to help local communities protect public health, safety, and the environment from chemical hazards.	Chemical inventories for the WVDP are reported quarterly under EPCRA as appropriate. There were no releases of hazardous substances in 2007 that triggered release notifications under EPCRA. No new chemicals exceeded their threshold planning quantities. Refer to Tables ECS-9 and ECS-10 at the end of this chapter.
42 USC §300f *et seq.*	The **Safe Drinking Water Act (SDWA)** of 1974 requires that each federal agency operating or maintaining a public water system must comply with all federal, state, and local requirements regarding safe drinking water. Compliance in New York State is verified by oversight of the New York State Department of Health (NYSDOH), through NYS Publc Health law, and the Cattaraugus County Department of Health.	The WVDP drinking water plant is considered a Class "C" system. All CY 2007 results from analyses of drinking water were reported within limits to the Cattaraugus County Health Department (CCHD). The annual drinking water system inspection was performed by the CCHD on November 28, 2007, during which backflow prevention testing documentation and operator training certifications were reviewed. All results were satisfactory.
10 CFR 851	10 CFR 851 **"Worker Safety and Health Program"** of 2006 requires DOE contractors to provide their workers with a safe and healthful workplace. To accomplish this objective, the rule established program requirements specific to management responsibilities, worker rights, hazard identification and prevention, safety health standards, required training, recordkeeping, and reporting.	WVES personnel revised procedures and programs to establish requirements to comply with 10 CFR 851. Any proposed modification, addition, or deletion that may invalidate a portion of the worker health and safety program at the WVDP must be approved by DOE-WVDP.
15 USC §2601 *et seq* .	The **Toxic Substances Control Act** of 1976 regulates the manufacture, processing and distribution of chemicals, including asbestos-containing material (ACM) and polychlorinated biphenyls (PCBs). Effective September 2006, the New York State Department of Labor (NYSDOL) significantly revised the asbestos regulations, cited in 12 NYCRR Part 56.	Due to regulation changes, operating procedures were revised, special training for asbestos workers was conducted, and the WVDP applied for and was granted site-specific variances. During 2007, all ACM activities were managed in accordance with the site "Asbestos Management Plan" and activities were completed by personnel certified by NYSDOL. Refer to Table ECS-5 for a summary of asbestos waste management activities. Management of PCBs was done in accordance with the WVDP "PCB and PCB-Contaminated Material Management Plan." The WVDP operators maintain an annual document log that details PCB use and changes in storage or disposal status.
7 USC §136 *et seq.*	The **Federal Insecticide, Fungicide, and Rodenticide Act** of 1996 and **NYS ECL** provided for EPA and NYSDEC control of pesticide distribution, sale, and use.	Chemical pesticides are applied at the WVDP only after alternative methods are evaluated by trained and NYSDEC-certified professionals and determined to be unfeasible. In 2007, approximately 450 pounds of a NYSDEC-registered biocide was added to the cooling water system. Control is necessary to minimize the potential for system damage due to algal buildup and the potential for worker exposure to waterborne pathogens such as *Legionella.*

TABLE ECS-1 *(continued)*
Compliance Status Summary for the WVDP in CY 2007

Citation	*Environmental Statute, DOE Directive, Executive Order, Agreement*	*WVDP Compliance Status*
NYS ECL, Article 15, Title 5, *et seq* .	**NYS ECL**, Article 15, Title 5, **Protection of Water** regulates the safety of dams and other surface water impounding structures, including construction, inspection, operation, maintenance and modification of these structures.	Two surface water impounding dam structures on the WNYNSC were inspected in July and August 2007. The routine inspections identified corrective maintenance activities that were completed prior to the end of CY 2007.
NYS Public Health Law	**Public Health Law**, Article 5 (Laboratories), Section 502 (Environmental Laboratories, Examinations, and Certifications of Approval)	The WVDP Environmental Laboratory (the URS Corporation Laboratory) is certified by NYSDOH for certain radiological and nonradiological constituents in potable and nonpotable water, as well as for asbestos in solids.
49 CFR Part 172, and 6 NYCRR Part 364.9	6 NYCRR Part 364.9 regulates handling and storage of potentially infectious regulated medical waste (RMW). 49 CFR Part 172, Subpart H regulates transportation safety and disposal of RMW at a licensed facility.	The on-site health services office is registered with NYS as a "Small Quantity Generator" of RMW. Medical services generate potentially infectious medical wastes that are securely stored in approved containers and periodically shipped off site. There were no RMW shipments in 2007. WVES does not currently maintain a contract with an approved RMW carrier.
16 USC §703 *et seq.*	The **Migratory Bird Treaty Act** of 1918 implemented various treaties and conventions between the U.S. and foreign countries for the protection of migratory birds. Under the Act, taking, killing, or possessing migratory birds is unlawful.	The DOE maintains, and complies with, a NYSDEC Division of Fish and Wildlife Bird Depredation License and a U.S. Fish and Wildlife Bird Depredation Permit for the WVDP.
16 USC §1531 *et seq.*	The **Endangered Species Act** of 1973 provided for the conservation of endangered and threatened species of fish, wildlife, and plants.	Several ecological surveys of the WNYNSC premises have been conducted. Except for "occasional transient individuals," no plant or animal species protected under the Endangered Species Act are known to exist at the Center.
16 USC §470	The **National Historic Preservation Act** of 1966 established a program for the preservation of historic properties throughout the nation.	Surveys have been conducted of the WNYNSC for historic and archaeological sites.
E.O. 11988	E.O. 11988, **Floodplain Management**, was issued to avoid adverse impacts associated with the occupancy and modification of floodplains and to avoid direct or indirect support of floodplain development wherever there is a practicable alternative.	No activities were performed during 2007 at the WVDP that would develop or be adversely impacted by the 100-year floodplain within the premises.
Stipulation Pursuant to NYS ECL Section 17-0303, and Section 176 of the Navigation Law	In accordance with **Stipulation No. R9-4756-99-03**, dated March 1999, the DOE agreed to install a soil bioventing system to remediate petroleum contaminated soils in the warehouse underground tank site (NYSDEC Spill number 9708617). The remediation plan was to construct a bioventing system, operate it for two calendar years, assess performance, and report to NYSDEC.	The system stimulated natural in-situ biodegradation of petroleum hydrocarbons in the soil by providing abundant oxygen to existing microorganisms. After reviewing soil and water sampling, analyses, and evaluations, NYSDEC determined that no further remediation was required. Final disposition of this area is pending decision in the Decommissioning and/or Long-Term Stewardship Environmental Impact Statement (EIS) for the WVDP and the WNYNSC.

TABLE ECS-1 *(concluded)*
Compliance Status Summary for the WVDP in CY 2007

Citation	*Environmental Statute, DOE Directive, Executive Order, Agreement*	*WVDP Compliance Status*
6 NYCRR 360	**NYS ECL Solid Waste Management Facility Regulations** define requirements for closure of nonradioactive solid waste disposal facilities in a manner that protects the environment.	In 1986, an engineering closure plan was submitted to and approved by NYSDEC for the Construction and Demolition Debris Landfill (CDDL). The closure was performed in accordance with landfill closure regulatory requirements specified in the approved closure plan. The plan also requires post-closure perpetual maintenance and annual reporting in this ASER. The CDDL cover was inspected for integrity and bare areas and the culverts were inspected for erosion and silting. All areas were found intact and the cover was rolled and mowed during 2007.

2007 Project Highlights

The WVDP Transition. The first phase of the WVDP Act, the immobilization of the liquid high-level radioactive waste (HLW) in borosilicate glass through vitrification, is complete and the focus of WVDP operations has changed. On June 29, 2007, the DOE awarded a new four-year West Valley Demonstration Project Interim End-State Contract (Contract DE-AC30-07CC30000) for management operations at the WVDP to West Valley Environmental Services Company LLC (WVES). The contract with West Valley Nuclear Services Company (WVNSCO) was transitioned to WVES on September 1, 2007, and work continued without interruption. All permits, licenses, and agreements were transitioned to WVES as appropriate. The scope of the new contract includes waste disposition, decontamination, deactivation, disposition of facilities, and infrastructure/landlord activities.

Activities during 2007 included: shipping the remainder of the cemented waste from the drum cell; decontamination and demolition of four more unneeded facilities; processing and packaging of low-level radioactive waste (LLW) for off-site shipment and disposal; continued operation of the remote-handled waste facility; treatment of radioactively contaminated groundwater; and environmental monitoring.

National Environmental Policy Act (NEPA). Under NEPA, the DOE is required to consider the overall environmental effects of its proposed actions. Draft documents are prepared that describe potential environmental effects associated with proposed Project activities. The level of evaluation and documentation depends upon whether the action constitutes a major federal action affecting the quality of the human environment within the meaning of NEPA. The categories of documentation include categorical exclusions (CXs), environmental assessments (EAs) and environmental impact statements (EISs).

CXs document actions that, by their nature, will not have a significant effect on the environment. EAs are used to evaluate the extent to which a proposed action, not categorically excluded, will affect the environment. Based on the analyses presented in an EA and considering regulatory agency, stakeholder, and public comment, the DOE may determine that the proposed action is not a major federal action significantly affecting the quality of the human environment within the meaning of NEPA. As a result, the DOE may issue a notice indicating the finding of no significant impact (FONSI) and therefore would not be required to prepare an EIS. If a proposed action has the potential for significant environmental effects, an EIS would be prepared that describes proposed alternatives to an action and explains the effects of each. Based on the analyses presented, and considering regulatory agency and public input, the DOE will determine the preferred alternative and issue a record of decision (ROD) regarding the action.

Since the Project began under the WVDP Act, a number of proposed site activities have warranted evaluations of overall environmental impact and preparations of draft EA and EIS documents to evaluate alternatives. Decisions resulting from the final EISs and associated RODs and EAs facilitate ongoing waste management and remediation activities at the Project. Those specific to activities at the WVDP are presented in Table ECS-2.

TABLE ECS-2
National Environmental Policy Act (NEPA) Documents Affecting DOE Activities at the WVDP

Year	*Action*	*Outcome*
1982	The final Environmental Impact Statement (EIS) and associated Record of Decision (ROD) were issued outlining the actions the United States (U.S.) Department of Energy (DOE) proposed for solidification of the liquid high-level waste (HLW) contained in the underground tanks (DOE-EIS-0081).	The first phase of the West Valley Demonstration Project (WVDP) Act, completed in September 2002, removed the HLW from the tanks and immobilized it into borosilicate glass through vitrification. The glass canisters remain on site in storage.
1988	The DOE published a Notice of Intent (NOI) with the New York State Energy Research and Development Authority (NYSERDA) to prepare the EIS for Completion of the WVDP and Closure or Long-Term Management of the Facilities at the Western New York Nuclear Service Center (WNYNSC).	
1996	The DOE and NYSERDA issued the "Draft EIS for the Completion of the WVDP and Closure or Long-Term Management of the Facilities at the WNYNSC" (DOE/EIS-0226-D).	The draft EIS was issued without a preferred alternative for a six-month review and comment period. After issuance of the draft EIS, and despite long negotiations, the DOE and NYSERDA were unable to reach an agreement on the future course of action for closure at the Center (see Government Accounting Office [GAO 2001]).
1997	Following issuance of the draft 1996 EIS, NYSERDA and the DOE formed a stakeholder advisory group (the West Valley Citizen Task Force [CTF]) to provide additional input to the public comment process required by NEPA.	The CTF mission is to provide stakeholder input to decision-making for development of a closure option for the WVDP and the WNYNSC. The mission has expanded to future site use, long-term stewardship, and regulatory issues.
1997	The DOE Headquarters issued the "Final Waste Management Programmatic EIS," (WM PEIS [DOE/EIS-0200F]) to evaluate nationwide management and siting alternatives for treatment, storage, and disposal of five types of radioactive and hazardous waste.	The EIS was issued with the intent to issue a separate ROD for each type of waste generated, stored, or buried over the next 20 years at 54 sites in the DOE complex.
1999	The DOE issued a ROD for nationwide management of HLW,Vol. 64, Federal Register (FR), p. 46661 (64 FR 46661)	The ROD specified that WVDP-vitrified HLW will remain in storage on site until it is accepted at a geologic repository.
2000	The DOE issued a ROD for nationwide management of low-level waste (LLW) and mixed LLW (65 FR 10061).	The Hanford site in Washington State and the Nevada Test Site were designated as national DOE disposal sites for LLW and mixed LLW.
2001	The DOE published an NOI (66 FR 16447) formally announcing its rescoping plan and preparation of the waste management EIS for the WVDP.	The rescoping plan split the scope of the 1996 WVDP Draft EIS into two phases: (1) near-term waste management decision-making and (2) final decommissioning and/or long-term stewardship decision-making.
2003	The DOE issued a notice of availability of the "WVDP Draft Waste Management EIS" (68 FR 26587).	The draft EIS presented alternatives for near-term management of WVDP LLW, mixed LLW, transuranic (TRU) waste, and HLW.
2003	The DOE, in cooperation with NYSERDA, issued an NOI (68 FR 12044) to issue an EIS for "Decontamination and/or Long-Term Stewardship at the WVDP and the WNYNSC."	As a result of comments in the scoping process and the complexity of issues relating to long-term agency responsibility, this EIS was put on hold (DOE-EIS-0226-R).
2005	The DOE issued a ROD, based on alternative A, for the "WVDP Waste Management EIS (WVDP WM EIS-0337)" (70 FR 35073).	As a result, the HLW canisters remain in storage on site until transfer to a geologic repository, the decision on TRU waste would be deferred until certification is obtained from the Waste Isolation Pilot Plant in Carlsbad New Mexico, and LLW and mixed LLW would be shipped off site according to the ROD for nationwide management of LLW and mixed LLW.
2006	Environmental Assessment (EA) DOE/EA-1552 and finding of no significant impact (FONSI).	The EA, with the associated FONSI, cleared the way for removal of 36 facilities that are (or in the next four years will be) no longer required to support activities at the WVDP.
2007	DOE issued an NOI to prepare an EIS for the disposal of Greater-Than-Class-C LLW Waste (72 FR 40135).	Nine scoping meetings were held and the scoping comment period ended in September 2007. The Draft EIS has not been issued.

The Draft EIS and the WVDP Core Team. The "EIS for the Decommissioning and/or Long-Term Stewardship at the WVDP and the WNYNSC," evaluating different scenarios for completing the DOE's mission at the Project, has been stalled for several years as involved agencies struggle with many of the difficult issues that the WVDP presents. As mentioned in Table ECS-2, in 2003 the DOE and the New York State Energy Research and Development Authority (NYSERDA) announced the intent to prepare the "EIS for the Decommissioning and/or Long-Term Stewardship at the WVDP and the WNYNSC." The DOE and NYSERDA are joint lead agencies on this EIS, and the EPA, Nuclear Regulatory Commission (NRC), and NYSDEC are cooperating agencies. As recently as September 2005, the DOE released a revised internal multi-agency pre-decisional draft. After agency reviews, a large number of comments on the pre-decisional draft were received. These comments addressed a wide range of technical issues and challenges.

In August 2006, in an effort to continue progress toward Project completion, the DOE-WVDP requested that the NRC, the EPA, NYSDOH, NYSDEC, and NYSERDA participate in a collaborative process (i.e., Core Team) to resolve technical issues and make recommendations associated with the draft Decommissioning and/or Long-Term Stewardship EIS. The WVDP Core Team was formed in November 2006. The Core Team approach is a formalized, consensus-based process in which those individuals with decision-making authority work together to reach agreement on key remediation decisions. Equally important, the Core Team worked to ensure that technical support staff were involved and communicating effectively throughout the decision-making process and that stakeholders were informed of the Core Team progress.

The Core Team meets regularly to evaluate site challenges and make recommendations to move the focus of the Project forward. In early 2008, the Core Team proposed a preferred alternative for the Draft Decommissioning EIS that would be implemented in two phases (phased decisionmaking).

Phase 1 would include removal of a number of the major facilities at the WVDP: relocation of the HLW canisters to a new facility to place them in a cost-effective configuration for future shipment, demolition of the main plant process building (MPPB), removal of the contaminated soil under the MPPB (i.e., the source area of the north plateau groundwater plume contamination), and the removal of the low-level waste treatment facility and lagoons. Essentially, this would include all facilities not needed to maintain the waste tank farm, the remainder of the north plateau plume, the NRC-licensed disposal area (NDA), and general site maintenance and monitoring. Removal of areas of higher surface soil contamination would advance overall WVDP soil management. After completion of Phase 1 activities, the following facilities/areas/materials would remain: (1) the waste tank farm, (2) the NDA and the state-licensed disposal area (SDA), (3) HLW solidified in waste canisters, (4) the remaining portion of the contaminated north plateau groundwater plume, (5) areas of low-level surface contamination, and (6) waste without off-site disposal options.

A decommissioning decision (Phase 2) for the remaining facilities/areas would be made no later than 30 years after the Phase 1 ROD.

Integration of decisions and actions over time is challenging, but essential to progressing toward completion of the WVDP Act. The revised draft decommissioning EIS is scheduled to be released for cooperating agency review in late 2008, followed by a six-month public review and comment period.

Resource Conservation and Recovery Act (RCRA)

RCRA and its implementing regulations govern the life cycle of hazardous waste from “cradle-to-grave” and mandate that generators take responsibility for ensuring the proper treatment, storage, and ultimate disposal of their wastes.

The EPA is responsible for issuing guidelines and regulations for the proper management of solid and hazardous waste (including mixed [radioactive and hazardous] waste). In New York, the EPA has delegated the authority to issue permits and enforce these regulations to NYSDEC. In addition, the U.S. Department of Transportation is responsible for issuing guidelines and regulations for labeling, packaging, and spill reporting for hazardous and mixed wastes while in transit.

Hazardous Waste Permitting. A hazardous waste permit is required for facilities that treat or store large quantities of hazardous waste for more than 90 days or dispose of hazardous waste at the facility. In 1984, the DOE notified the EPA of hazardous waste activities at the WVDP and identified the DOE as a generator of hazardous waste.

RCRA Part A Permit Application. In 1990, to comply with Title 6 of the Official Compilation of Codes, Rules, and Regulations of the State of New York (6 NYCRR) Part 373-3, a RCRA Part A (i.e., Interim Status) Permit Application for the WVDP was filed with NYSDEC for storage and treatment of hazardous and mixed wastes. The WVDP has operated under interim status ever since. Facility operations are limited to those described in the RCRA Part A Permit Application and must comply with the interim status regulations; therefore, it must be revised prior to changes to the Project's waste management operations. The Februrary 2007 update of the RCRA Part A Permit Application is currently under NYSDEC review.

In accordance with the RCRA Part A Permit, the DOE prepared closure plans for the hazardous waste management units at the WVDP. The closure plans were transmitted to NYSDEC in anticipation of closure activities, and are revised as appropriate to address NYSDEC comments or changes in activities. In 2006, the DOE initiated clean closure of two units. Activities included NYSDEC notification of the closure schedule, removal of the waste, and decontamination of the impacted areas. As specified in the interim waste storage facility (IWSF) closure plan, clean closure confirmation sampling and analysis were performed and results were evaluated for presentation in a closure certification report. Once NYSDEC approved the IWSF closure plan, the closure certification report was submitted and subsequently approved.

The closure plan was also submitted to NYSDEC for the lag storage building (LSB), and clean closure of the unit was performed under interim status. NYSDEC approval of the LSB closure plan is pending; once approved, the closure certification report will be submitted.

A third unit, the lag storage area (LSA) #1 (a unit that was not used for the management of hazardous or mixed waste) was also demolished. A correspondence was transmitted to NYSDEC that documented the waste management history of the unit and requested removal from the RCRA Part A Permit Application.

6 NYCRR Part 373-2 Permit Application. In 2003, NYSDEC made an official request for the submittal of a 6 NYCRR Part 373-2 Permit Application (i.e., Part B) for the WVDP. The complete 6 NYCRR Part 373-2 Permit Application was transmitted to NYSDEC in December 2004. This application included RCRA closure plans for all interim status units that continued to be managed in accordance with 6 NYCRR Part 373-3 until a final determination by NYSDEC on this permit application is made and a 6 NYCRR Part 373-2 permit is issued.

RCRA §3008(h) Administrative Order on Consent. Section 3008(h) of RCRA authorizes the EPA to issue an order requiring corrective action to protect human health or the environment if there has been a release of hazardous waste or hazardous constituents to the environment from an interim status facility. The DOE and NYSERDA entered into a RCRA §3008(h) Administrative Order on Consent (the Consent Order) with NYSDEC and the EPA in March 1992.

- RCRA Facility Investigation (RFI)

  The Consent Order required NYSERDA and the DOE's WVDP office to conduct RFIs (unit-specific environmental investigation) at solid waste management units (SWMUs) to determine if there had been a release or if there were a potential for release of RCRA-regulated hazardous constituents from SWMUs.

  Because many SWMUs are contiguous, or so close together as to make their separate monitoring impractical, many SWMUs have been grouped into larger units, referred to as super SWMUs (SSWMUs). This terminology is unique to the WVDP, and is not an official regulatory term. Descriptions of the SSWMUs, with the associated constituent SWMUs, as well as the individual SWMUs, are presented in Table ECS-4. Figures A-8 and A-9 in Appendix A show the locations of the WVDP SSWMUs. The final RFI reports were submitted in 1997, completing the investigative activities associated with the Consent Order. No corrective actions were required at that time as a result of the RFIs.

  Groundwater monitoring, as recommended in the RFI reports and approved by the EPA and NYSDEC, continued during 2007 in compliance with the requirements of the Consent Order. The groundwater monitoring results and the groundwater program at the WVDP are discussed in Chapter 4 "Groundwater Protection Program."

- Current Conditions Report

  Pursuant to a request from NYSDEC, a report entitled "West Valley Demonstration Project Solid Waste Management Unit Assessment and Current

Conditions Report" was submitted in November 2004. This report summarized the historic activities at individual SWMUs through the RFI activities and provided environmental monitoring data and information on site activities performed since the completion of the RFI reports.

- Corrective Measures Study (CMS)

  After review of the Current Conditions Report, NYSDEC determined that CMSs pursuant to the Consent Order were required for six select SWMUs at the WVDP. Draft revisions to the "CMS Work Plan for Select SWMUs" were submitted to NYSDEC. Current revisions of the draft CMSs remain in review with the DOE.

- Interim Measures (IM)

  NDA Cap - The NDA has been identified as an SWMU, regulated under the Consent Order. As result of the "CMS Work Plan for Select SWMUs" and in response to Core Team comments on the work plan, the DOE evaluated engineering controls to improve the integrity of the NDA cap. Pursuant to Section VI, paragraph 7 of the Consent Order, the DOE is implementing an IM to ensure a minimum four-foot-thick earthen cap, minimize the potential release of impacted groundwater from the NDA, and minimize water infiltration into the NDA until the final disposition of the NDA is determined and can be implemented. The activity included the installation of a geosynthetic cap over the NDA and a low-permeability subsurface groundwater cutoff wall (slurry wall) upgradient of the NDA. The proposed action falls within the scope and intent of the categorical exclusion for small-scale, short-term cleanup actions, described in 10 Code of Federal Regulations (CFR) §1021, Subpart D, Appendix B, CZ B6.1.

  Soil test borings were completed in late 2007 to determine the till interface conditions around the NDA to support the slurry wall installation. Excavation for the slurry wall was completed on July 28, 2008. Completion of the field work and installation of the cap was accomplished in the 2008 construction season.

  Storm Water Runoff at the NDA - To evaluate storm water discharges associated with construction activities for capping of the NDA and installation of the slurry wall, a supplement to the existing sitewide "Storm Water Pollution Prevention Plan" (SWPPP) was prepared. The plan's intent was to identify potential sources of pollution in storm water runoff at the construction site, and to develop practices to limit potential impacts from runoff. Since this is an IM conducted under the Consent Order, NYSDEC determined that the SWPPP met the substantiative requirements of the SPDES general permit for storm water discharges from construction activities. Therefore, discharges of storm water from the construction activities were monitored and evaluated in accordance with the existing SPDES permit.

  Refer to Chapter 4, "Groundwater Protection Program," for a discussion of groundwater in the vicinity of the NDA.

- Quarterly Reporting to NYSDEC

  In accordance with the Consent Order, the DOE transmits a quarterly progress report to NYSDEC that summarizes all Consent Order activities conducted at the WVDP for the previous quarter. The summary includes progress and accomplishments, contacts with local community interest groups and regulatory agencies, changes to personnel, projected future work activities, and an inventory of mixed waste that was generated from decontamination activities during the reporting period.

Hazardous Waste Management. Under RCRA, hazardous wastes at the WVDP are managed in accordance with 6 NYCRR Parts 370–374 and 376. Hazardous and mixed waste activities are reported to NYSDEC annually in the WVDP's Annual Hazardous Waste Report, which specifies the quantities of waste generated, treated, and/or disposed of, and identifies the treatment, storage, and disposal facilities used. The Annual Hazardous Waste Report for 2007 was submitted to NYSDEC in February 2008.

Additional reports are submitted each year to document hazardous waste reduction efforts. Pursuant to Article 27, Section 0908 of New York State Environmental Conservation Law (ECL), an annual update of the WVDP's Hazardous Waste Reduction Plan must be submitted to NYSDEC. The updates are submitted in two forms which differ slightly in scope. The plan is updated biennially to reflect changes in the types and amounts of hazardous wastes generated at the WVDP. The biennial update to the Hazardous Waste Reduction Plan for CY 2006 was submitted to NYSDEC on June 20, 2007. Every other year, the Annual Status Report, essentially an abbreviated version of the biennial update, is submitted. The CY 2007 Annual Status Report for the Hazardous Waste Reduction Program was submitted to NYSDEC on June 25, 2008.

Mixed Waste Management. Mixed waste was managed according to the WVDP "Site Treatment Plan." No mixed waste was shipped from the WVDP in 2007. (See Table ECS-5.)

Nonhazardous, Regulated Waste Management. Nonradioactive, nonhazardous material was shipped off site to solid waste management facilities in 2007. Certain components of this waste (lead-acid batteries and spent lamps [universal wastes]) were reclaimed or recycled at off-site, authorized reclamation and recycling facilities. Digested sludge from the site sanitary and industrial wastewater treatment facility was shipped to the Buffalo Sewer Authority for disposal. Sanitary treated wastewater is routinely sampled and discharged to Erdman Brook under the auspices of the WVDP's SPDES permit. Quantities of nonhazardous wastes handled in 2007 are summarized in Table ECS-5.

Waste Minimization and Pollution Prevention. Waste minimization and pollution prevention objectives are summarized under Executive Order 13423 in Table ECS-1. WVES submits an annual pollution prevention report to the DOE summarizing recycling and waste generation information. See Table ECS-6, "Pollution Prevention Progress for FY 2007;" Table ECS-7, "Affirmative Procurement Accomplishments for FY 2007;" and Chapter 1, Environmental Management System.

Accomplishments at the WVDP in 2007

As a result of decisions made under the WVDP Waste Management EIS, Class A, B, and C LLW and mixed LLW have a disposal path to off-site facilities. Therefore, waste management, characterization, packaging, and shipping activities continued in 2007. In addition, DOE/EA-1552 and the associated FONSI cleared the way for continued decontamination, demolition, and removal of more obsolete structures. The major accomplishments in 2007 were:

- Drum Cell Waste Shipped

  By the end of October 2007, the remainder of the approximately 20,000 half-ton drums of cemented Class C LLW were removed from storage in the drum cell and shipped to the Nevada Test Site for disposal. The drum cell shipping campaign was expected to take 2.5 years when it began in mid-2006. Instead, process improvements and efficiencies allowed the work to be completed more than one year ahead of schedule and nearly 50% below the original cost estimate.

- MPPB Decontamination, Decommissioning, and Waste Management

  Decontamination work was completed in the fuel receiving and storage area pump pit. Other waste processing and shipping activities included removing stored waste for processing and shipping waste off site for disposal.

- South Plateau Hardstand Cleanup

  A concerted effort was made to remove excess materials from the south plateau. Legacy waste was shipped for disposal, a leaded glass window was returned to the manufacturer, a used fiberglass oil tank was transferred to a local town for waste oil storage, and two used nonradioactive stainless-steel tanks were sent off site for recycling.

- Infrastructure Reduction

  Four more structures, identified in DOE/EA-1552, were demolished and removed from the site. The test and storage building, maintenance shop, main 1 warehouse, and the schoolhouse were demolished and removed. Combined with the 11 structures removed in 2006, 15 of the 36 structures scheduled for removal in DOE/EA-1552 have been demolished.

Refer to Table ECS-5 for a breakdown of waste volumes (by classification) shipped for disposal in 2007.

Environmental Issues

Unplanned Releases. No unplanned releases of pollutants or hazardous substances, radiological or nonradiological, from the WVDP occurred in 2007.

Final Decision on Coalition Suit Over the WVDP EIS Process. On August 26, 2005, the Coalition on West Valley Nuclear Wastes (the Coalition [a citizens' group]) filed a complaint in the U.S. District Court, Western District of New York, against the DOE regarding the NEPA process at the WVDP.

In the complaint, the Coalition contended that the March 26, 2001 DOE announcement which revised the EIS for completion of the WVDP Act violated NEPA and the Stipulation of Compromise Settlement between the DOE and the Coalition. It also requested that the DOE be ordered to complete the EIS process as outlined in 1988, requested a declaration that stated separating the EIS into two EISs violated NEPA, and sought a declaration that the DOE is not empowered to reclassify waste at the WVDP using the "waste incidental to reprocessing" determination process.

On September 28, 2007, the U.S. District Court, Western District of New York ruled to dismiss the complaint. Refer to Case 1:05-cv-00614-JTC, Document 41, filed September 28, 2007, for the ruling in its entirety.

Proposed Congressional Legislation. In mid-2005, proposed legislation addressing the long-term responsibility for the WVDP was introduced into the U.S. House of Representatives by Congressmen Kuhl, Boehlert, Reynolds, and Higgins, and a companion bill was introduced into the U.S. Senate by Senators Schumer and Clinton. The bill, entitled "West Valley Remediation Act of 2005," included provisions for federal (DOE) takeover of the responsibility for the WVDP and the entire WNYNSC from the current owner, the state of New York. The legislation directed the DOE to complete and issue a draft of the site's decommissioning and long-term stewardship EIS within two years of enactment of the law. The bill also included a provision for minimum funding levels and prohibited any new waste from being transported to West Valley.

In 2007, the bills were reintroduced in the U.S. Senate and House of Representatives as the "West Valley Remediation Act of 2007." This legislation remains in committee in both houses of Congress.

NYSERDA Files Suit to Determine Federal Responsibilities at the West Valley Site. On December 11, 2006, the NYSERDA Board of Directors voted to authorize legal action against the DOE over issues related to ongoing cleanup responsibilities at the West Valley site. The legal complaint was filed in U.S. District Court in Buffalo on behalf of New York State against the federal government regarding the cleanup at West Valley. NYSERDA is a plaintiff in the lawsuit, along with the state of New York and NYSDEC. New York is suing the U.S. government to clarify federal responsibilities for the West Valley site.

Since the end of 2007, the litigation has been stayed pending the outcome of discussions between the parties regarding respective cleanup responsibilities.

Project Assessment Activities in 2007

Throughout CY 2007, assessments were conducted through the Integrated Assessment Program (IAP) at the WVDP. This program effectively complies with applicable DOE Directives, Regulations, Standards, and Integrated Safety Management System requirements. The IAP applies to all disciplines including, but not limited to, safety and health, operations, maintenance, environmental protection, quality, decontamination and decommissioning, HLW activities, emergency management, business processes, and management. During CY 2007, there were 57 formal surveillances, assessments, and audits performed. In addition, inspections, reviews, and oversight activities are routinely conducted to evaluate performance, reduce risk, and identify improvement opportunities.

The local DOE Project office and other agencies with responsibilities for the WVDP also independently reviewed various aspects of the environmental and waste management programs. At the conclusion of the reporting period, there were no outstanding issues that had not been satisfactorily addressed. Overall results reflected continuing, well-managed environmental programs at the WVDP.

TABLE ECS-3
WVDP Environmental Permits

Permit Name and Number	*Agency/Permit Type*	*Description*	*2007 Changes*	*Status*
West Valley Demonstration Project (WVDP) Resource Conservation and Recovery Act (RCRA) Part A Permit Application (EPA ID #NYD980779540)	NYSDEC/ Hazardous Waste	Provides interim status under RCRA for treatment and storage of hazardous waste.	The DOE is currently operating under the June 2001 NYSDEC-approved RCRA Part A Permit Application.	No expiration date. A RCRA Part 373-2 Permit (i.e., Part B) Application was submitted for review and approval to NYSDEC on December 23, 2004.
Air Facility Registration Certificate (9-0422-00005/00099)	NYSDEC/Air Emissions	Certificate caps NO_x and SO_x emissions from 2 boilers.	None	No expiration date.
Slurry-fed ceramic melter (modification to WVDP-687-01) process building ventilation	EPA/NESHAP	Slurry-fed ceramic melter radionuclide emissions — main plant stack modified February 18, 1997.	On September 1, 2007, EPA was advised that WVES, LLC is the new operating contractor.	Permit approved February 18, 1997. No expiration date.
Vitrification Facility Heating, Ventilation, and Air-Conditioning System (no permit number)	EPA/NESHAP	Vitrification facility HVAC system for radionuclide emissions	On September 1, 2007, EPA was advised that WVES, LLC is the new operating contractor.	Permit approved February 18, 1997. No expiration date.
01-14 Building Ventilation System (WVDP-187-01)	EPA/NESHAP	Liquid waste treatment system ventilation of radionuclide emissions in the 01-14 building.	On September 1, 2007, EPA was advised that WVES, LLC is the new operating contractor.	Issued October 5, 1987. Modified May 25, 1989. No expiration date.
Contact Size-Reduction Facility (WVDP-287-01)	EPA/NESHAP	Contact size-reduction and decontamination facility radionuclide emissions	On September 1, 2007, EPA was advised that WVES, LLC is the new operating contractor.	Issued October 5, 1987. No expiration date.
Supernatant Treatment System/Permanent Ventilation System (WVDP-387-01)	EPA/NESHAP	Supernatant treatment system ventilation for radionuclide emissions	On September 1, 2007, EPA was advised that WVES, LLC is the new operating contractor.	Modified January 1, 1997. No expiration date.
Outdoor Ventilated Enclosures (WVDP-587-01)	EPA/NESHAP	Fifteen portable ventilation units for removal of radionuclides.	EPA granted approval to expand usage of PVUs from 10 to 15. The DOE will track usage on the basis of annual cumulative estimated dose.	Issued December 22, 1987. Permit modification issued on December 10, 2007.

Note: Permit and license expiration dates are current as of November 2008.

TABLE ECS-3 *(concluded)*
WVDP Environmental Permits

Permit Name and Number	***Agency/Permit Type***	***Description***	***2007 Changes***	***Status***
State Pollutant Discharge Elimination System (NY0000973)	NYSDEC/Water	Regulates discharges to surface waters from various on-site sources.	An amended permit went into effect on September 1, 2006. NYSDEC was advised that WVES is the new WVDP operator.	Permit expires February 1, 2009. A SPDES permit application modification was submitted to NYSDEC in July 2008.
NYSDOH Environmental Laboratory Approval Program (ELAP) Certification to URS Corporation, Lab ID #10474	NYSDOH/ environmental laboratory certification	Certification of the Environmental Laboratory for the analysis of potable and nonpotable water samples for specific radiological and nonradiological constituents and for asbestos in friable material.	Certification was transferred from WVNSCO to URS Corporation in April 2006. The certificate was revised throughout the year as new constituents were added. Certification was renewed on April 1, 2008.	Certification expires April 1, 2009.
Buffalo Pollutant Discharge Elimination System (08-05-TR096)	Buffalo Sewer Authority/ sanitary sewage and sewage sludge disposal	Permit issued to hauler of waste from the wastewater treatment facility.	Hauler renewed permit in August 2008.	Permit expires June 30, 2009
Chemical Bulk Storage (CBS) (#9-000158)	NYSDEC/ regulated chemical bulk storage tanks	Registration of bulk storage tanks used for listed hazardous chemicals.	As of May 2006, the WVDP no longer has tanks regulated under chemical bulk storage regulations (6 NYCRR Parts 595–599).	If regulated CBS tanks are added, WVES will include the existing CBS Registration when submitting the application.
Petroleum Bulk Storage (#9-008885)	NYSDEC/ petroleum bulk storage tank	Registration of bulk storage tanks used for petroleum.	License was renewed on August 18, 2006.	License expires September 2, 2011.
Asbestos-Handling License WVNSCO # 99-0427 WVES # 33657	NYSDOL/ Asbestos handling and sampling activities	WVES maintains the asbestos-handling license and specific variances for asbestos handling and monitoring.	License was transferred from WVNSCO to WVES and renewed in September 2008.	License expires on September 30, 2009; each variance has a unique expiration date.
Bird Depredation License (32)	NYSDEC/ Division of Fish and Wildlife	State license for the removal of nests of migratory birds.	License was renewed on June 30, 2007.	License was applied for and awaiting issuance.
Bird Depredation Permit (MB747595-0)	U.S. Fish and Wildlife Service	Federal permit for the limited taking of migratory birds and active bird nests.	Permit was renewed on October 8, 2008.	Permit expires September 30, 2009.

Note: Permit and license expiration dates are current as of November 2008.

TABLE ECS-4
Solid Waste Management Units at the WVDP

WVDP RCRA SSWMUs and Constituent SWMUs Identified in the RFI		
SSWMU	***SWMU #***	***Constituent SWMUs***
SSWMU #1 – Low-Level Waste Treatment Facilities (LLWTF)	3, 4, 17, 17a, and 17b	Former Lagoon 1 LLWTF and LLWTF Lagoons 2, 3, 4, and 5 Neutralization pit and interceptors
SSWMU #2 – Miscellaneous Small Units	5, 6, 7, and 10	Demineralizer sludge ponds, and solvent dike Effluent mixing basin Waste paper incinerator
SSWMU #3 – Liquid Waste Treatment System (LWTS)	18, 22, and 18a - Sealed Rooms	LWTS Cement Solidification System Sealed Rooms in the Main Plant Process Building
SSWMU #4 – High-Level Waste (HLW) Storage and Processing Area	12/12a, 13, 19, and 20	HLW Vitrification Facility and HLW Tank Farm Vitrification Test Facility waste storage areas Supernatant Treatment System
SSWMU #5 – Maintenance Shop Leach Field	8	Maintenance Shop Leach Field
SSWMU #6 – Low-Level Waste Storage Area	9/9a, 15, and 16/16a	Lag Storage (LSA #1 [old] and #2 [new] Hardstands) Lag Storage Building, Lag Storage extension and Lag Storage Addition (LSA #3 and #4)
SSWMU #7 – Chemical Process Cell (CPC) Waste Storage Area	14	CPC Waste Storage Area
SSWMU #8 – Construction and Demolition Debris Landfill (CDDL)	1	Construction and Demolition Debris Landfill
SSWMU #9 – NRC-Licensed Disposal Area (NDA)	2, 11/11a, 23, and 39	NDA Kerosene tanks and NDA container storage area Trench interceptor project and staging area for NDA
SSWMU #10 – Integrated Radwaste Treatment System (IRTS)	21	IRTS Drum Cell
SSWMU #11 – New York State-Licensed Disposal Area (SDA)	NA	The SDA is a closed radioactive waste landfill that is contiguous with the Project premises and is owned and managed by the New York State Energy Research and Development Authority (NYSERDA). For more information, see the NYSERDA website at www.nyserda.org.
SSWMU #12 – Hazardous Waste Storage Lockers	24	Hazardous waste storage lockers 1 to 4

TABLE ECS-4 *(concluded)*
Solid Waste Management Units at the WVDP

WVDP RCRA Individual SWMUs Not Associated with an SSWMU		
Individual SWMUs	25	Inactive scrap metal landfill adjacent to bulk storage warehouse
	26	Subcontractor maintenance area
	27	Fire brigade training area
	28	Vitrification hardstand
	29	Industrial waste storage area
	30	Cold hardstand area near the CDDL
	31	NDA trench soil container area
	32	Old sewage treatment facility
	33	Existing sewage treatment facility
	34	Storage locations for well purge water
	35	Construction and demolition area
	36	Old school house septic system
	37	Contact size-reduction facility
	38	Drum super compactor
	39	Staging area for the NDA
	40	Satellite Accumulation Areas and 90-day storage areas
	41	Designated roadways
	42	Product storage area
	43	Warehouse extension staging area
	44	Fuel receiving and storage area; high-intensity container and SUREPAK™ staging area
	45	Breach in laundry wastewater line
	46	Vitrification vault and empty container hardstand
	47	Remote-handled waste facility

TABLE ECS-5
Summary of Waste Management Activities at the WVDP in CY 2007

Waste Description	*Type of Project*	*2007 Weight or Volume*	*Discussion*
LLW	Legacy waste disposition	109 thousand ft^3 (3.09 thousand m^3)	Waste processed, packaged, and shipped
Drum cell waste	Waste shipping	241.5 thousand ft^3 (6.8 thousand m^3)	Waste shipped
Mixed low-level waste	Waste management according to the Site Treatment Plan	None shipped	No mixed waste was shipped during 2007
Radiological wastewater from the low-level liquid waste treatment facility (LLW2 [WNSP001])	NYSDEC regulates point-source liquid effluent discharges of treated process and sanitary wastewater through the State Pollutant Discharge Elimination System (SPDES) Permit for the WVDP.	About 10.8 million gallons (40.7 million liters)	During 2007, six batches of wastewater were processed through the LLW2. There were no effluent limit exceptions to the requirements in the DOE's SPDES permit.
Treated sewage and industrial wastewaters (WNSP007)	Wastewater processing, discharge	3.1 million gallons (11.7 million liters)	The wastewater treatment facility (WWTF) treated sanitary wastewaters that were discharged through WNSP007.
North plateau groundwater recovery system (NPGRS)	Pump and treat strontium-90 (Sr-90) contaminated groundwater	3.02 million gallons (11.5 million liters)	The NPGRS operated to recover groundwater from an area near the leading edge of the Sr-90 plume on the north plateau. Water was treated by ion exchange to remove Sr-90, then transferred to the LLW2.
NRC-licensed disposal area groundwater interceptor trench (WNNDATR)	Interceptor trench and groundwater pre-treatment	390 thousand gallons (1.48 million liters)	Groundwater was pumped and transferred to the LLW2. No n-dodecane or tributyl phosphate were encountered in 2007, therefore, no pre-treatment was necessary.
Sanitary and industrial	Cleanup-stabilization	1,389 tons (1,260 metric tons)	Debris around the site disposed as trash.
Digested sanitary sludge	Waste shipping and disposal	162 tons (147 metric tons)	Digested sludge from the WWTF was shipped to the Buffalo Sewer Authority for disposal.
Asbestos	Asbestos management and abatement	36 linear feet of pipe insulation, 14 linear feet of fire proofing, and 150 square feet of non-friable heat shields.	Removal of the asbestos supported demolitions of the test and storage building, the maintenance shop, and the main warehouse.

TABLE ECS-6
Pollution Prevention Progress for FY 2007

Recycled Materials	*2007 Quantity (tons/metric tons)*
Office and mixed paper	26.6 tons (24.2 metric tons)
Corrugated cardboard	16.9 tons (15.4 metric tons)
Stainless steel	43.1 tons (39.2 metric tons)
Copper	1.9 tons (1.77 metric tons)
Iron	383 tons (348 metric tons)
Aluminum cans	0.20 tons (0.18 metric tons)
Precious metals (platinum)	1.69 lbs (0.768 kg)
Engine oils	1.29 tons (1.17 metric tons)
Toner cartridges	0.60 tons (0.54 metric tons)
Batteries	2.82 tons (2.57 metric tons)
Concrete	471 tons (429 metric tons)
Fluorescent bulbs	0.70 tons (0.64 metric tons)
Plastic	0.65 tons (0.60 metric tons)
Styrofoam	0.010 tons (0.009 metric tons)
Wood	1.47 tons (1.34 metric tons)
Electronics	4 desktop computers, 55 monitors and 6 laptops

TABLE ECS-7
Affirmative Procurement Accomplishments for FY 2007

Environmentally Preferable Products	*Amount Purchased*
Plastic envelopes	$1,048.00
Plastic trash bags	$54,432.65
Printer ribbons	$1,287.26
Toner cartridges	$7,799.86
Sanitary tissue products	$20,747.35
Paperboard and packaging products	$512.00
Uncoated printing papers	$24,588.52
Re-refined lubricating oil	$237.15

TABLE ECS-8
WVDP 2007 Air Quality Noncompliance Episodes

Permit Type	*Facility*	*Parameter*	*Date(s) Exceeded*	*Description/ Solutions*
EPA NESHAP	All	All	None	None
NYSDEC Air	All	All	None	None

Note: There were no episodes of noncompliance in 2007.

TABLE ECS-9
Status of EPCRA (SARA Title III) Reporting at the WVDP in 2007

EPCRA Section	*Description of Reporting*	*Status*
EPCRA 302–303	Planning Notification	Not Required
EPCRA 304	Extremely Hazardous Substance Release Notification	Not Required
EPCRA 311	Material Safety Data Sheet	Not Required
EPCRA 312	Chemical Inventory	Required
EPCRA 313	Toxic Release Inventory Reporting	Not Required

[a] "Required" indicates that the site reported under the provision.
"Not Required" indicates that the site was not required to report under the provision.

TABLE ECS-10
Reportable Chemicals Above EPCRA 312 Threshold Planning Quantities
Stored at the WVDP in 2007

Hydrogen peroxide solution (35%)	Portland cement	Ion-exchange media
Liquid nitrogen[a]	Diesel fuel #2	Sodium hydroxide
Oils - various grades	Gasoline	Sulfuric acid

[a] The liquid nitrogen tank was emptied in August 2007.

TABLE ECS-11
WVDP 2007 NPDES/SPDES[a] Permit Noncompliance Episodes

Permit Type	*Outfall(s)*	*Parameter*	*No. of Permit Exceptions*	*No. of Samples Taken*	*No. of Compliant Samples*	*Percent Compliant Samples*
SPDES	All	All	0	1,531	1,531	100%

[a] Radionuclides are not regulated under the site's SPDES permit. However, special requirements in the permit specify that the concentration of radionuclides in the discharge is subject to requirements of DOE Order 5400.5.

TABLE ECS-12
WVDP Migratory Bird Nest Depredation Episodes in 2007

Permit/License Type	*Parameter*	*Permit/License Limit*	*Total Removed in 2007*
U.S. Fish and Wildlife - Bird Depredation Permit	Removal of Active Barn Swallow Nests	15	5
U.S. Fish and Wildlife - Bird Depredation Permit	Removal of Active American Robin Nests	15	1
U.S. Fish and Wildlife - Bird Depredation Permit	Removal of Active Eastern Phoebe Nests	5	0
U.S. Fish and Wildlife - Bird Depredation Permit	Removal of Active Canada Goose Nests	5	0
NYSDEC - Bird Depredation License	Removal of Inactive Migratory Bird Nests	Not limited	6

ENVIRONMENTAL MANAGEMENT SYSTEM

Integrated Safety Management System (ISMS) Implementation

A plan to integrate environmental, safety, and health (ES&H) management programs at the West Valley Demonstration Project (WVDP or Project) was developed and initiated in 1998. Implementation of an ISMS at the WVDP was verified by the United States (U.S.) Department of Energy (DOE) in November 1998. Environmental subject matter experts routinely participate in a site-wide work review group to review work plans, identify ES&H concerns, and specify practices that ensure work is performed safely. For the purposes of this policy, the term “safety” includes environmental, radiological, industrial/chemical, and nuclear safety and health and encompasses the public, workers, and the environment.

Environmental Management System (EMS)

During the development of the ISMS, the environmental management system (EMS) was identified as an integral part of the ISMS. The WVDP EMS satisfies the requirements of DOE Order 450.1, "Environmental Protection Program." The EMS is also in compliance with the "Code of Environmental Management Principles" (CEMP) for federal agencies and the International Organization for Standardization 14001, Environmental Management Systems: "Specification for Guidance and Use," which is being implemented worldwide. Following the principles and performance objectives of the CEMP helps to ensure that a federal facility's environmental performance is proactive, flexible, cost-effective, and sustainable.

The Project's EMS provides the basic policy and direction for work at the WVDP through procedures that support proactive management, environmental stewardship, and the integration of appropriate technologies throughout all aspects of work. The environmental monitoring program is an important component of the EMS and accomplishment of its mission.

As the Western New York Nuclear Service Center is no longer an active nuclear fuel reprocessing facility, the environmental monitoring program at the WVDP focuses on measuring radioactivity and chemical constituents associated with the aged residual by-products of former Nuclear Fuel Services Inc. operations, the Project’s former high-level radioactive waste (HLW) treatment operations, and the current operations for management of HLW, transuranic waste, and low-level radioactive waste (LLW). On June 29, 2007, the DOE awarded a new four-year contract for the management and operation of the WVDP. West Valley Environmental Services LLC (WVES) was awarded the WVDP Interim End-State Contract (Contract DE-AC30-07CC30000) that includes in its scope waste disposition, decontamination, deactivation, disposition of facilities, and infrastructure/landlord activities.

Elements of the WVDP EMS implementation are summarized in Table 1-1.

The Project's ISMS and EMS policies are integrated into all aspects of work at the WVDP. The following sections depict accomplishments at the WVDP associated with specific 2007 EMS activities.

Environmental Policy

Activities at the WVDP during 2007 were conducted in full compliance with applicable environmental statutes, DOE directives, executive orders, and state laws and regulations. All environmental permits, licenses and agreements were transitioned from West Valley Nuclear Services Company, Inc. (WVNSCO) to WVES as appropriate. Refer to Table ECS-1, "Environmental Compliance Status Summary for the WVDP in 2007," for details.

Environmental Aspects and Impacts

Since the Project work scope currently encompasses waste disposition, decontamination, deactivation, disposition of facilities, and infrastructure reduction, the significant environmental aspects of current site activities are related to decommissioning and demolition activities. For each facility or structure that is under consideration for demolition, the base environmental aspects have been identified. These aspects are addressed during work planning

TABLE 1-1
Elements of the Environmental Management System (EMS) at the WVDP

EMS Element	*WVDP Implementation*
Environmental Policy	The environmental policy at the West Valley Demonstration Project (WVDP) is to conduct all activities, including design, construction, testing, startup, commissioning, operation, maintenance, and decontamination and decommissioning in a manner appropriate to the nature, scale, and environmental impacts of these activities. West Valley Environmental Services LLC (WVES) is committed to full compliance with applicable federal and New York State laws and regulations for the protection of the environment, continual improvement, the prevention and/or minimization of pollution, and public outreach, including stakeholder involvement.
Environmental Aspects and Impacts	When operations have an environmental aspect, WVES implements the EMS to minimize or eliminate any adverse potential impact. Implementation of an EMS is a prerequisite for the United States (U.S.) Environmental Protection Agency (EPA) National Environmental Performance Track (P-Track) awarded by the EPA to the WVDP. Using the EMS, WVDP employees evaluate operations, identify the aspects of operations that can impact the environment, and determine those impacts that are significant. The following operational aspects have been determined to have the potential to affect the environment: • Waste generation, management, and decontamination activities; • Atmospheric emissions and liquid effluents; • Storage or use of chemicals and radioactive materials; • Natural resource usage and noise disturbance; and • Disturbances to soil and to endangered species/protected habitats.
Legal and Other Requirements	WVES has implemented an environmental regulatory review and assessment process to deliver WVDP-level requirements and guidance to all staff. New or revised requirements (e.g., new regulations) are analyzed to determine their applicability to the WVDP and to identify whether actions are required to achieve compliance. This may involve developing or revising WVDP documents or operating procedures, implementing administrative controls, providing training, installing engineered controls, or increasing monitoring.
Objectives and Targets	The performance-based management system is designed to develop, align, balance, and implement the strategic objectives for the WVDP, including environmental objectives. Objectives and targets are developed by calendar year (CY). For the three-year period of CY 2007–2009, WVES defined four commitments under the EPA P-Track. These commitments, and progress toward achieving the objectives, are presented later in this chapter.
Environmental Management Program	A pollution prevention program to conserve resources and minimize waste generation is implemented at the WVDP. The budgeting system is designed to ensure that priorities are balanced and that resources essential to the implementation and control of the EMS are provided.
Structure and Responsibility	All employees at the WVDP have specific roles and responsibilities in key areas, including environmental protection. Environmental and waste management technical support personnel assist the line organization with their environmental responsibilities.
Training, Awareness, and Competence	Training on EMS requirements has been provided to staff whose responsibilities include environmental protection. The training program includes general environmental awareness for all employees, regulatory compliance training for select staff, and specific courses for managers, internal assessors, EMS implementation teams, and operations personnel whose work can impact the environment.

TABLE 1-1 *(concluded)*
Elements of the Environmental Management System (EMS) at the WVDP

EMS Element	*WVDP Implementation*
Communication and Community Involvement	The WVDP representatives continue to improve processes for internal and external communications on environmental issues. Communications with the local community include monthly meetings with the local Citizen Task Force and meetings with the general public on a quarterly basis. Project information, including this entire Annual Site Environmental Report, is available on the internet at http://www.wv.doe.gov. Notable community involvement activities by the WVDP personnel in 2007 included participation in the United Way Day of Caring and the mentoring program with local schools.
EMS Documentation	Comprehensive, up-to-date environmental policies are written to describe the EMS. These procedures and manuals inform staff how to control processes and perform work at the WVDP in a manner that protects the environment.
Document Control	A comprehensive electronic document control system to ensure the effective management of procedural documents is maintained. When facilities require additional procedures to control their work, document-control protocols are implemented to ensure that workers have access to the current version of procedures.
Operational Control	Operations are evaluated for the adequacy of current controls to prevent impacts to the environment. As needed, additional administrative or engineered controls are identified and plans for upgrades and improvements are developed and implemented.
Emergency Preparedness and Response	An emergency preparedness and response program with specialized staff provides timely response to hazardous material releases or other environmental emergencies. This program includes procedures for preventing, as well as responding to, emergencies.
Monitoring and Measurement	Liquid effluent and air-emission monitoring helps ensure the effectiveness of controls, adherence to regulatory requirements, and timely identification and implementation of corrective measures. A comprehensive, sitewide environmental monitoring program is in place at the WVDP. Results are reported to regulatory agencies and summarized in this ASER. In addition, monitoring data are assessed for adverse trends to determine site performance, impacts from site conditions, and the need for preventative or corrective measures.
Nonconformance and Corrective and Preventive Actions	The WVDP employees continue to implement processes that identify and correct problems. This includes a lessons learned program to prevent recurrences, robust self-assessment and environmental assessment programs, and an electronic action tracking system.
Records	EMS-related records, including audit and training records, are maintained to ensure integrity, facilitate retrieval, and protection from loss.
EMS Audit	To periodically verify that the EMS is operating as intended, assessments are conducted by the DOE and its contractors. These assessments are designed to ensure that nonconformances are identified and addressed. In addition, compliance with regulatory requirements is verified through routine inspections, operational evaluations, and periodic assessments and self-assessments.
Management Review	In addition to audits, a management review process has been established to involve top management in the overall assessment of environmental performance, the EMS, and progress toward achieving environmental goals. This review also identifies, as necessary, the need for changes to and continual improvement of the EMS.

with the assistance of the Hazard Control Specialists. In addition, before a building may be demolished, a Demolition Readiness Checklist which captures many of these environmental aspects, must be completed.

Legal Requirements

Requirements contained in DOE orders and directives are incorporated into the new WVDP Interim End-State Contract with WVES as specific terms and conditions. The WVES Environmental Affairs (EA) Department conducts environmental regulatory reviews to identify, evaluate, and document changes to applicable environmental regulations. Items that have an effect upon compliance activities at the WVDP are communicated to EA and other Project personnel.

Objectives and Targets

National Environmental Performance Track. In 2000, the U.S. Environmental Protection Agency (EPA) recognized the WVDP as a charter member of the Performance Track (P-Track) Program for implementation of its EMS. The focus of the P-Track is to ensure that the EMS has sufficient programs in place to perform effectively, and to identify and address opportunities to improve environmental performance.

The WVDP has completed two rounds of environmental commitments under the EPA P-Track. Four initial commitments were accomplished over a three-year period from calendar year (CY) 2001 to CY 2003 with CY 2000 as the baseline. Three additional performance goals were accomplished over the next three-year period from CY 2004 through CY 2006, using CY 2003 as the baseline.

To maintain certification in the P-Track program, annual reports are submitted to the EPA. The reports include topics such as EMS audits, issues and corrective actions, progress toward commitments, reporting, and public outreach. WVES renewed its application to the program by identifying four new commitments for 2007. WVES, in conjunction with the DOE, submitted the P-Track annual performance report to the EPA in March 2008, for CY 2007, demonstrating the facility's progress toward its performance commitments and to maintaining qualifications under the program. The commitments (to be met by the end of CY 2009 with CY 2006 as the baseline) and the 2007 annual reporting accomplishments were to reduce the following:

- total non-transportation energy usage by 5%: total energy usage was reduced by 15.6% in CY 2007;
- amount of liquid nitrogen used by 10%: liquid nitrogen usage was reduced by 45.3% in CY 2007;
- amount of resins used for the treatment of radiologically contaminated wastewater generated by plant operations by 10%: this goal is in the planning stages with engineering and design efforts complete in CY 2007 and planning for implementation in CY 2008; and
- amount of SO_x air emissions from non-transportation purposes by 10%: SO_x emissions were reduced by 61.4% in CY 2007.

Environmental Management Program

An environmental management program is a key element to the successful implementation of an EMS. An integral part of the WVDP environmental management program is the "Waste Minimization and Pollution Prevention Awareness Plan" (WMin/P2). The plan established the strategic framework for integrating waste minimization and pollution prevention into waste generation and reduction activities, the procurement of recycled products, the reuse of existing products, and the use of methods that conserve energy. The program is a comprehensive and continual effort to prevent or minimize pollution, with the overall goals of reducing health and safety risks, and protecting the environment. Refer to the EPA P-Track progress and renewed commitments described above. Also refer to the Environmental Compliance Summary Table ECS-6, "Pollution Prevention Progress for FY 2007," and Table ECS-7, "Affirmative Procurement Accomplishments for FY 2007."

Training, Awareness, and Competence

Until April 2007, the WVNSCO teams and subcontractors had attained a remarkable safety record by achieving nearly 5 million consecutive safe work hours over a period of more than 4½ years without a lost time accident or illness. However, a personal injury event at the WVDP in April 2007, coupled with an increase in first-aid cases, triggered an investigation of the series of incidents.

Management initiated a comprehensive root cause analysis and an overall assessment of the ISMS implementation across site-wide operations. Independent subject matter personnel from Washington

Group international and representatives of the DOE-Headquarters (HQ) Environmental Management-62 (EM-62) organization were brought to the site to review the events. The reviews from both the internal and external assessments indicated that human performance and behaviors were at the heart of the personal injury events. As a result, the key element of the corrective action plan was to reinstitute human performance/behavior-based safety (HP/BBS) training across the site. The initiative included training of all Project personnel to HP/BBS concepts and practices, followed by HP/BBS observer technique training for safety department and safety observers.

In addition, more emphasis was placed on self-assessment activities as one of the corrective actions for attaining improved worker safety. Accordingly, an enhanced Conduct of Operations self-assessment schedule was established and implemented.

Voluntary Protection Program (VPP) STAR Status. In May 2000, WVNSCO received its first certification of the WVDP as a VPP STAR Site for recognition of excellent worker safety and health programs. The safety policy is to conduct its business in a manner that ensures the safety and well-being of employees and subcontractors. The goals are zero unsafe acts, injuries, occupational illnesses, unsafe conditions, environmental insults, or radiological contaminations. WVES management continues to focus on strengthening the ISMS/EMS as work scopes change and intends on continued participation in the VPP program.

10 Code of Federal Regulations (CFR) 851, "Worker Safety and Health Program." 10 CFR 851 became effective in February 2007, with full implementation at the WVDP by May, 2007. The law supersedes DOE Order 440.1A, "Worker Protection Management for DOE Federal and Contractor Employees," which directed compliance with specific Occupaton Safety and Health (OSHA) requirements.

Similar to OSHA, the rule establishes the framework for an effective worker safety and health program that provides DOE contractor workers with a safe and healthful workplace in which workplace hazards are abated, controlled or otherwise mitigated in a matter that provides reasonable assurance that workers are adequately protected from identified hazards. To accomplish this objective, the law established program requirements specific to management responsibilities, worker rights, hazard identification and prevention, safety and health standards, required training, recordkeeping and reporting.

In compliance, WVDP personnel revised procedures and programs to comply with 10 CFR 851, and issued the "WVDP Worker Safety and Health Plan" for DOE approval. Any modification, addition, or deletion that could invalidate a portion of the worker health and safety program requires approval by the DOE. The significant impacts to the workforce are: (1) WVES is subject to inspection by the DOE and can be cited and fined for any violation, (2) fire protection inspection frequencies increased to weekly or monthly from the current schedule, (3) WVDP-310, Addendum 1, "Worker Safety and Health Plan," was developed, which describes how the WVDP complies with 10 CFR 851, and (4) violations to 10 CFR 851 are tracked.

Any person working at the WVDP who has a personal photo badge allowing unescorted access to administrative areas of the site receives general employee training that covers health and safety, emergency response, and environmental compliance issues. All visitors to the WVDP receive a site-specific briefing on safety and emergency procedures.

Hazardous waste operations and emergency response regulations require that employees at treatment, storage, and disposal facilities receive training appropriate to their job function and responsibilities. The WVDP environmental, health, and safety training matrix identifies the specific training requirements for such employees.

Training programs include, but are not limited to:

- 24-hour/40-hour hazardous waste operations;
- emergency spill-response training;
- decontamination techniques;
- waste minimization and pollution prevention;
- the WVDP environmental management program;
- radiation hazards and warnings;
- dosimetry and respiratory protection;
- medical emergency response training; and
- electrical safety and fire protection.

Training programs have evolved into a comprehensive curriculum of knowledge and skills necessary to maintain the health and safety of employees and ensure the continued compliance of the WVDP with applicable regulations and requirements.

Safety-Trained Supervisor (STS) Program. Since November 2003, WVNSCO/WVES has maintained an STS certification program whereby employees complete an extensive program to become safety-certified. Certification and renewal requirements include at least 30 hours of safety-related training and successful completion of a certification exam. Standards, established by the Council on Certification of Health, Environmental, and Safety Technologists, ensure that certified individuals have a broad understanding of industrial safety. The benefits at the site include increased safety awareness among employees, an improved site safety culture, and increased confidence when dealing with safety and health matters during the planning and field phases of work. Currently there are 63 certified WVES safety-trained supervisors at the WVDP.

Communication

During 2007, internal communications increased as the new four-year WVDP Interim End-State Contract was awarded to WVES. Transition activities and determination of a baseline for the four-year contract required extensive turnover communications and input.

Concurrently, the Core Team member communications involving the EPA, the Nuclear Regulatory Commission (NRC), the New York State Department of Environmental Conservation (NYSDEC), the New York State Department of Health (NYSDOH), the New York State Energy Research and Development Authority (NYSERDA), and DOE site managers increased throughout 2007. These communications resulted in a determination, and presentation to public stakeholders, of a recommendation for a draft preferred alternative for the decommissioning Environmental Impact Statement (EIS) that would be implemented in two phases (phased decisionmaking). See the Environmental Compliance Summary for further discussion.

Operational Control

NRC-Licensed Disposal Area (NDA) Interceptor Trench and Pretreatment System. Radioactively contaminated n-dodecane, in combination with tributyl phosphate (TBP), was discovered in groundwater at the northern boundary of the NDA in 1983, shortly after the DOE assumed control of the WVDP. To mitigate subsurface migration of this radioactive organic mixture, an interceptor trench and liquid pre-treatment system (LPS) were installed.

As in previous years, n-dodecane/TBP contamination was not detected in the trench water; therefore, no water was treated by the LPS in 2007. Approximately 390 thousand gallons (1.48 million liters) of radiologically contaminated water were pumped and transferred from the interceptor trench to the low-level waste treatment facility (LLW2) during CY 2007. Refer to the Environmental Compliance Summary for a discussion of the interim measure to construct a cap over the NDA. Refer also to Chapter 4, "Groundwater Protection Program," under "Groundwater Sampling Observations on the South Plateau: Weathered Lavery Till and the NDA" for a discussion of results of surface and groundwater monitoring in the vicinity of the trench .

Process Sewer Integrity Evaluation. Video inspection of camera-accessible process sewer lines was initiated in 2003, and a breach was identified in a tributary line allowing laundry wastewater to discharge to subsurface soil. Wastewater from the laundry was immediately directed through an alternate pipeline to the LLW2, and the breached line was taken out of service. Following full investigations and reporting to NYSDEC, a New York State-licensed professional engineer (PE) performed an integrity evaluation of the process sewer system and prepared a final report that identified actions to be implemented. The initial recommendations of the PE have been completed. The final recommendation, to perform routine cleaning and reinspection of accessible main service lines and operational clean-out risers, is to be fully implemented by November 2009.

Environmental Monitoring and Measurement

Human beings are exposed to radioactivity from site activities primarily through air, water, and food. All three potential exposure pathways are monitored at the WVDP, but air and surface water pathways are the two primary means by which radioactive material can move off site.

The on-site and off-site monitoring program at the WVDP includes measuring the concentration of alpha and beta radioactivity, conventionally referred to as "gross alpha" and "gross beta," in air and water effluents. Measuring the total alpha and beta radioactivity from key locations produces a comprehensive picture of on-site and off-site levels of radioactivity from all sources. For a DOE site such as the WVDP, frequent updating and tracking of the overall radioactivity levels in effluents is an important tool in maintaining acceptable operations.

More-detailed measurements are also made for specific radionuclides.

The radionuclides monitored at the Project are those that might produce relatively higher doses or that are most abundant in air and water effluents. Because man-made sources of radiation at the Project have been decaying for more than 35 years, the monitoring program does not routinely include short-lived radionuclides, that is, isotopes with a half-life of less than two years, which would be present at less than 1/100,000 of the original radioactivity levels.

The WVDP monitoring program includes monitoring wastewater discharges and storm water for nonradiological water quality and chemical constituents. See Appendix A for the schedule of sample locations and analytical requirements and Chapter 2 for a discussion of nonradiological program information.

Environmental Management of Wastewater. Water containing radioactive material from site process operations is collected and treated in the LLW2, which includes the LLW treatment building and associated holding lagoons.

Treated process water is held, sampled, and analyzed before its release through a New York State Pollutant Discharge Elimination System (SPDES)-permitted outfall. In 2007, about 10.8 million gallons (40.7 million liters) of water were treated in the LLW2 system and discharged through outfall 001, the lagoon 3 weir. Table 1-2 summarizes the estimated releases of radioactivity in the 2007 discharge waters, as compared to the previous 10-year average. (Also, see Table 2-1 in Chapter 2.) Note that releases of tritium and gross alpha and beta activity through outfall 001 were below the 10-year averages.

Effective operation of the site wastewater treatment facilities is indicated by compliance with the applicable discharge limits regulated by the SPDES permit. Approximately 60 chemical and water quality constituents are monitored regularly. The analytical results are reported to NYSDEC via Discharge Monitoring Reports, required under the SPDES program. There were no SPDES effluent limit exceptions for chemical constituents during 2007. Historical limit exceptions are discussed in previous ASERs. Although the goal of the LLW2 and sanitary wastewater treatment facility operations is to maintain effluent water quality consistently within the permit requirements, if SPDES permit limit exceptions occur, the exceptions are evaluated to determine their cause and to identify corrective measures.

TABLE 1-2
2007 Radioactivity Releases Versus 10-Year Averages[a]

Radionuclide	*10-Year Average Curies*	*2007 Curies*	*% of 10-Year Average*
Aqueous Discharge LLW2			
Tritium	0.16	0.053	34%
Gross Alpha and Beta	0.016	0.011	72%
Airborne Discharge ANSTACK			
Gaseous			
Tritium	0.029	0.0021	7.0%
Iodine-129	0.0017	0.000027	1.6%
Particulate			
Gross Alpha and Beta	0.00024	0.000013	5.5%

[a] All numbers were rounded to two significant digits after calculations were complete. Percentages based on the above total curie values may not exactly match those in the table.

- North Plateau Groundwater Recovery System (NPGRS)

  The NPGRS operated throughout 2007, recovering groundwater from an area near the leading edge of the strontium-90 plume on the north plateau. Approximately 3.02 million gallons (11.5 million liters) were recovered during 2007. For a more-detailed discussion of the plume and the NPGRS, see "Groundwater Sampling Observations on the North Plateau" and "Strontium-90 Plume Remediation Activities" in Chapter 4.

Environmental Management of Airborne Emissions. During operations, ventilated air from the various WVDP facilities is continuously sampled for radioactivity in gases and particulate matter. Ventilated air is monitored and an alarm is activated if particulate matter radioactivity increases above preset levels. Samples are analyzed in the laboratory for the specific radionuclides that are present in the radioactive materials being handled in the facilities. (See "Air Emissions" in Chapter 2.)

Ventilation air through facilities undergoing radioactive material cleanup passes through high-efficiency filters before being released to the atmosphere. The filters are generally more effective for particulate matter than for gaseous radioactivity. For this reason, facility air treatment tends to remove a lesser percentage of gaseous radioactivity (e.g., tritium and iodine-129) than radioactivity associated with particulate matter (e.g., strontium-90 and cesium-137). However, gaseous radionuclide emissions still remain so far below the most restrictive regulatory limits for public safety that additional treatment technologies beyond those already provided are not necessary.

Table 1-2 shows the gaseous and particulate matter radioactivity emissions from the main plant (location ANSTACK) in 2007 compared to averages from the previous 10-year period. These 2007 values are low in comparison with the 10-year average that includes several years when the vitrification system was operating.

Environmental Performance Measures

Performance measures can be used to evaluate effectiveness, quality, timeliness, safety, or other areas that reflect achievements related to organization or process goals, and can be used as tools to identify the need to institute changes.

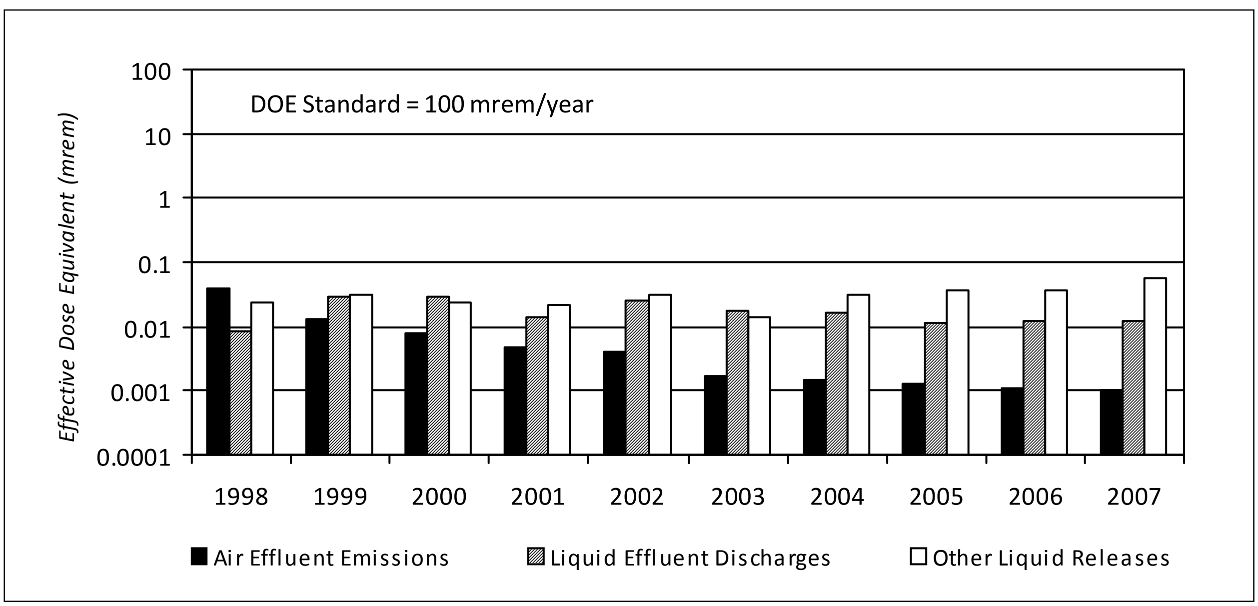
Dose Assessment. As an overall assessment of Project activities and the effectiveness of the as-low-as-reasonably-achievable policy, the low potential radiological dose to the maximally exposed off-site individual (MEOSI) is an indicator of well-managed radiological operations.

The relative dose equivalents for radiological air emissions, liquid effluent discharges, and other liquid releases (such as swamp drainage) from 1998 through 2007 are graphed on Figure 1-1. Note that, when summed, the total is well below the DOE standard of 100 mrem per year. The consistently low effluent results indicate that radiological activities at the site are well-controlled. (See also Table 3-2 in Chapter 3, "Dose Assessment.")

Groundwater Monitoring. The groundwater program is implemented at the WVDP according to Resource Conservation and Recovery Act §3008(h) Administrative Order on Consent requirements, as approved by NYSDEC and the EPA. Monitoring continued during 2007. Refer to Chapter 4, "Groundwater Protection Program," for details.

Environmental Management of Radiation Exposure. Environmental radiation is measured with thermoluminescent dosimeters (TLDs) at on-site and off-site locations. See Figures A-11 through A-14 for the locations of on-site and off-site TLD monitoring points. Although exposure rates at most on-site locations in 2007 were elevated with respect to background, results from perimeter TLDs that would be more representative of exposure to the public were statistically

FIGURE 1-1
Annual Effective Dose Equivalent to the Maximally Exposed Off-Site Individual



indistinguishable from background results. (See "Environmental Radiation" in Chapter 2.)

Quality Assurance (QA) Program

The QA program at the WVDP provides for and documents consistency, precision, and accuracy in collecting and analyzing environmental samples and in interpreting and reporting environmental monitoring data. Under contract with the DOE, WVES implements the QA program at the WVDP. Subcontractor laboratories providing analytical services for the environmental monitoring program are contractually required to maintain a QA program consistent with WVES requirements.

10 CFR Part 830, Subpart A, "Quality Assurance Requirements," Section 830.122, "Quality Assurance Criteria," and DOE Order 414.1C, "Quality Assurance" (DOE, 2005), document the QA program policies and requirements applicable to activities at the WVDP. The WVDP QA program serves to implement the DOE Order 450.1 requirement to provide "a consistent system for collecting, assessing, and documenting environmental data of known and documented quality." The integrated QA program also incorporates the requirements from the consensus standard "Quality Assurance Program Requirements for Nuclear Facilities" (American Society of Mechanical Engineers NQA-1, 1989). Controlled documents specific to the WVDP are used to implement the integrated QA program.

General areas addressed by the QA program include the following:

Responsibility. Responsibilities for overseeing, managing, and conducting an activity must be clearly defined. Personnel who verify that an activity has been completed correctly must be independent of those who performed it. Managers of programs, projects, and tasks at the WVDP are responsible for ensuring that QA requirements applicable to activities under their cognizance are implemented.

Planning. Work activities must be planned beforehand, the plan followed, and activities documented. Purchases of quality-affecting equipment or items must be planned, specified precisely, and verified for correctness upon receipt.

Training. Anyone performing an activity in support of the WVDP environmental monitoring program must be trained in the appropriate procedures and qualified accordingly before carrying out the activity.

Control of Design, Procedures, Items, and Documents. Any activity, equipment, or construction must be clearly described or defined and tested. Changes in the design must be tested and documented. Procedures must clearly state how activities will be conducted. New procedures must be developed each time an activity is added to the monitoring program. Procedures are reviewed periodically, updated when necessary, and are controlled so that only approved and current procedures are used.

Equipment or particular items affecting the quality of environmental data must be identified, inspected, calibrated, and tested before use. Calibration status must be clearly indicated. Items that do not conform to requirements must be identified as nonconforming and segregated so as to prevent inadvertent use.

Corrective Action. Conditions adverse to quality must be promptly identified, a corrective action planned, responsibility assigned, and the problem remedied.

Documentation. Records of all activities must be kept to verify what was done and by whom. Records must be clearly traceable to an item or activity. Records such as field data sheets, chain-of-custody forms, requests for analysis, sample shipping documents, sample logs, data packages, training records, and weather measurements, in addition to other records in both paper and electronic form, are maintained as documentation for the environmental monitoring program.

Quality Control (QC)

The QC practices, an integral part of the WVDP QA program, are used to ensure that samples are collected and analyzed in a consistent and repeatable manner. QC methods are applied both in the field and in the laboratory.

Field QC. Procedures are defined for collecting each type of sample, such as surface water, groundwater, soil, and air. Trained Environmental Laboratory (ELAB) field personnel collect the samples. Field sampling locations are clearly marked to ensure that routine samples are collected in the same location each time. Collection equipment that remains in the field is routinely inspected, calibrated, and maintained, and automated sampling stations are kept locked to prevent tampering. Samples are collected into certified pre-cleaned containers of an appropriate material and capacity. Containers are labeled with information about the sample, such as date and time of collection, sample collection personnel, and special field conditions. Collection information is documented and kept as part of the sample record.

Chain-of-custody documentation is maintained so as to trace sample possession from time of collection through analysis. Samples are stored in a locked, secure location before analysis or shipping. Samples sent off site for analysis are accompanied by an additional chain-of-custody form. Subcontract laboratories are required by contract to maintain internal chain-of-custody records and to store the samples under secure conditions.

Special field QC samples are collected and analyzed to assess the sampling process. Duplicate field samples are used to assess sample homogeneity and sampling precision. Field and trip blanks (laboratory-deionized water in sample containers) are used to detect contamination potentially introduced during sampling or shipping. Environmental background samples (samples of air, water, vegetation, venison, and milk taken from locations remote from the WVDP) are collected and analyzed to provide baseline information for comparison with on-site or near-site samples so that site influences can be evaluated.

Laboratory QC. In 2007, samples were collected by personnel from the URS ELAB. On-site analyses were performed at the ELAB or the Wastewater Treatment Facility Laboratory. Off-site analyses were performed by General Engineering Laboratories (GEL, in Charleston, South Carolina), Test America Laboratories, Inc. (formerly Severn Trent Laboratories, in Buffalo, New York), Lionville Laboratory, Inc. (in Lionville, Pennsylvania), and CH2M-WG Idaho, LLC (at the Idaho National Laboratory). As samples were collected, shipped, and analyzed, chain-of-custody documentation was maintained to track sample possession from time of collection through analysis and data reporting. All laboratories are required to maintain relevant certifications, to participate in applicable crosscheck programs, and to maintain a level of QC as defined in their contracts.

To analyze environmental samples from the state of New York, both on-site and subcontract analytical laboratories are required to maintain the relevant NYSDOH Environmental Laboratory Approval Program certification.

Laboratory QC practices specific to each analytical method are described in approved references or procedures. QC practices include proper training of analysts, maintaining and calibrating measuring equipment and instrumentation, and routinely processing laboratory QC samples such as standards and spikes (to assess method accuracy), duplicates and replicates (to assess precision), and blanks (to assess the possibility of contamination). Standard reference materials (materials with known quantities or concentrations of constituents of interest) traceable to the National Institute of Standards and Technology are used to calibrate counting and test instruments and to monitor their performance.

Crosschecks. Crosscheck samples (performance evaluation samples) contain a concentration of a constituent of interest known to the agency conducting the crosscheck, but unknown to the participating laboratory. Crosscheck programs provide an additional means of testing accuracy of environmental measurements. Subcontract laboratories are required to perform satisfactorily on crosschecks, defined as having at least 80% of reported results falling within control limits. Crosscheck results that fall outside of control limits are addressed by formal corrective actions to determine any conditions that could adversely affect sample data and to ensure that actual sample results are reliable.

The WVDP participates in formal crosscheck programs for both radiological and nonradiological analyses.

- Radiological Crosschecks

  Organizations performing radiological analyses as part of effluent or environmental monitoring are encouraged by the DOE to participate in formal crosscheck programs to test the quality of environmental measurements being reported to the DOE by its contractors. Crosscheck samples for radiological constituents are analyzed on site by the ELAB and off site by GEL. In 2007, the WVDP participated in the DOE Radiological Environmental Sciences Laboratory Mixed Analyte Performance Evaluation Program (MAPEP). Results are listed in Appendix H.

- Nonradiological Crosschecks

  As a New York State Pollutant Discharge Elimination System (SPDES) Permittee, the WVDP is required to participate in the U.S. EPA Discharge Monitoring Report - QA performance evaluation studies for the National Pollutant Discharge Elimination System. Samples from this program are analyzed both on site and by subcontract laboratories. In addition, subcontract laboratories performing nonradiological analyses of samples that contain radiological contamination participate in the DOE MAPEP program. This mixed analyte program provides performance evaluation samples for both radiological and nonradiological constituents.

In 2007, nonradiological crosschecks were analyzed by the WVDP Wastewater Treatment Facility Laboratory, the ELAB, LVLI, GEL, and TestAmerica. Results are summarized in Appendix H.

Results for 2007 from all laboratories that analyzed samples from the WVDP monitoring program are summarized in Table 1-3. As presented, 98.7% of the crosschecks performed in 2007 were acceptable.

TABLE 1-3
Summary of Crosschecks Completed in 2007

Type	*Number Reported*	*Number Within Acceptance Limits*	*Percent Within Limits*
Radiological	37	36	97.3%
Nonradiological	115	114	99.1%
All types	152	150	98.7%

Data Management

The Environmental Laboratory Information Management System (LIMS) is a database system used at the WVDP for establishing sample identification number, maintaining the sample data log, tracking samples, managing field and analytical data, and recording status and results of data validation. The LIMS is used as a controlled-source database for generating reports and statistical evaluations of data sets to support environmental surveillance activities. Subcontract laboratories are requested to provide data in electronic format for direct entry into the LIMS by WVDP personnel.

All software packages used to generate data are verified and validated before use. All analytical data produced in the ELAB at the bench level are reviewed and signed off by a qualified person other than the one who performed the analysis. A similar in-house review is contractually required from subcontractor laboratories.

Data Verification and Validation

Data validation is the process by which analytical data from both on-site and off-site laboratories are reviewed to verify proper documentation of sample processing and data reporting, and to determine the quality and usability of the data. A graded approach is applied that, based upon data quality objectives, dictates the rigor of review of the documentation associated with sample collection and/or sample analysis. In the WVDP environmental program, each data point is validated per approved standard procedures before it is assigned approval status and made ready for data assessment.

Data Assessment and Reporting

Validated analytical data, field information, and historical project data are integrated and evaluated to determine whether the constituents of interest are actually present and, if so, at what concentrations. Data problems identified at this level are investigated and appropriately resolved.

Data from the environmental monitoring program are then evaluated to assess the effect, if any, of the site operations and activities on the environment and the public. Data from each sampling location are compared with historical results from the same location, with comparable background measurements, and (if applicable) with regulatory limits or guidance standards. Standard statistical methods are used to evaluate the data.

Before each technical report is issued, the final document is comprehensively reviewed by one or more persons who are knowledgeable in the technical aspects of the work.

Audits and Assessments

Audits and assessments must be conducted to verify compliance with all aspects of the QA program and to determine its effectiveness. The WVDP environmental monitoring program is subjected to audits by external agencies and to internal management and self-assessments.

Environmental Monitoring Program Self-Assessments. Two monitoring program self-assessments were completed in 2007. The first was focused on the WVDP meteorology program and the second on safety conditions and practices during routine and non-routine sample collection activities. No findings or observations were noted. (Note: A "finding" is a noncompliance of a program element or an item to a specification, procedure, or commitment. An "observation" is a condition that, if left uncorrected, could lead to a "finding.") Good practices above and beyond those required by procedural compliance were noted, and some recommended actions (such as training additional personnel to provide backup) were identified to improve the program.

NYSDEC SPDES Audit. NYSDEC performed an annual inspection of the SPDES program at the WVDP on April 26, 2007. The inspection included facility walkdowns of select storm water outfalls, the NDA, the sewage treatment plant, the Lagoon 3 discharge weir, plus operational discussions. No findings or observations were identified. During the inspection, one action was initiated to provide the geotechnical report to NYSDEC, regarding the “Lagoon 3 Embankment Stability Study,” which was performed in March 2006. Responses to NYSDEC comments on the geotechnical report were satisfactorily addressed by WVES, and actions were incorporated into a standard operating procedure that provides for periodic inspection of the lagoon 3 embankment for stability, and for recording water level measurements.

WVES QA Department Off-Site Audit. The WVES QA department conducted an audit of off-site laboratory GEL which performs radiobioassay for the WVDP, in October 2007. The audit of GEL focused on laboratory compliance with contractual QA requirements of the contract. One finding, incomplete documentation of training for two employees, was noted. Corrective action was taken by GEL in January 2008, when GEL provided complete training documentation to resolve the issues identified during the audit.

WVES QA Audit of the ELAB. The WVES QA department conducted an audit of the URS ELAB in December 2007. The ELAB audit focused on compliance with relevant requirements from the WVDP Quality Management Manual, the WVDP Environmental Laboratory Approval Program (ELAP) Quality Manual, and National Environmental Laboratory Accreditation Conference (NELAC), Chapter 5. One observation was noted during the audit of the ELAB, that one employee had not documented completion of required training within the allotted time. The condition was corrected within days of the audit and the audit was closed.

NYDSOH Audit. In April 2007, NYSDOH conducted an audit of the ELAB by reviewing procedures for which the laboratory is NYSDOH ELAP-certified. This was the first audit of the laboratory since NYSDOH ELAP accreditation of radiological procedures was obtained. All methods of certification were reviewed (chemical, radiological, and asbestos testing), as well as sample receipt, storage, and preservation. No findings were noted.

NESHAP Audit. Also in April 2007, DOE conducted a surveillance of the draft National Emissions Standards for Hazardous Air Pollutants (NESHAP) report for 2006 and of the "Proposal for a Modified NESHAP Airborne Radionuclide Monitoring Program for the WVDP." No findings or observations were noted. However, several comments were included in the surveillance report that summarized items discussed during the surveillance and clarifications that had been made concerning the two documents as a result.

EMS Program Assessment. Prior to contract transition to WVES, Washington Regulatory and Environmental Services (WRES) performed an assessment of the WVNSCO EMS from June 18 to June 29, 2007. The assessment was performed to assess the adequacy and effectiveness of the WVDP EMS relative to:

- WVNSCO environmental policy commitments;
- EMS requirements necessary for the company's continued participation in the EPA P-Track program; and
- requirements of the DOE 450.1 portion of the ISMS annual review.

The assessment demonstrated that the WVNSCO EMS is adequate and effective in meeting its policy commitments and is in conformance with the P-Track and DOE O 450.1 requirements. There were no nonconformances identified. A core benefit to an EMS is the application of the continuous improvement cycle. As a result of the assessment, there were three recommendations for improvement. The first related to clearly defining the process used for ranking significance of aspects. The second recommendation was to update the Waste Minimization/Pollution Prevention Awareness Plan. While the program was still relevant and applicable structurally, goals past fiscal year 2005 had not been incorporated into the plan even though P-Track commitments have been in place and have been achieved. The third recommendation was to improve awareness and recognition of the EMS as a key part of the ISMS and of the base environmental aspects.

WVES continues the EMS policy at the WVDP and all recommendations were implemented before the end of 2007.

Lessons Learned. Lessons learned data from audits, appraisals, and self-assessments are shared internally and externally through the WVDP lessons learned program. The WVDP maintains this system to promote the recurrence of desirable events and to minimize the recurrence of undesirable events.

Summary. Although areas for improvement were identified in the course of audits and assessments, nothing was found that would compromise the quality of the data in this report or the environmental monitoring program in general.

Changes in the 2007 Environmental Monitoring Program

Over the last few years, activities on site have focused on dismantlement and decontamination of facilities, demolition of unnecessary structures, and processing and shipping of waste. Hazards on site are being reduced, as are potential pollutant sources. In late 2007 the environmental monitoring program was thoroughly evaluated and changes were identified to streamline the program in response to changing Project activities.

Each sampling location was evaluated on several bases: (1) regulatory requirements or other drivers, (2) pathways and hazard conditions, (3) a statistical evaluation of up to 16 years of monitoring data at each location, and (4) a determination of the need for additional data and/or ongoing monitoring for each constituent. The statistical evaluations indicated that the frequency of samplingand the number of constituents at some locations could be reduced without any reduction in the quality of the Environmental Monitoring Program. As a result, sampling at several locations was discontinued altogether, frequency of sampling at other locations was cut back, and the number of constituents monitored at some locations was reduced.

Environmental monitoring program modifications were implemented in January of 2008. The maps in Appendix A have been color-coded to show those locations at which sampling has remained unchanged, those locations at which sampling has been modified, and those locations at which sampling is no longer necessary. Specific program changes in CY 2007 and in CY 2008 at each location, with the rationale for the change, are summarized in Appendix A.

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ENVIRONMENTAL MONITORING

Monitoring Program

The goal of the West Valley Demonstration Project (WVDP or Project) environmental monitoring program is to ensure that public health and safety and the environment continue to be protected with respect to releases from site activities. To achieve this goal, possible exposure pathways are monitored.

The primary focus of the monitoring program is on surface water and air pathways, as these are the principal means by which potential contaminants are transported off site. Samples are collected from water, air, and other environmental media and measured for radiological and nonradiological constituents. A description of and schedule for the sampling program at each location and discussion of the environmental monitoring program drivers and rationale are presented in Appendix A, as well as maps showing the 2007 sampling locations. In accordance with United States (U.S.) Department of Energy (DOE) Order 450.1, the monitoring program includes both effluent monitoring and environmental surveillance.

Effluent Monitoring. Liquid effluents and air emissions are monitored by collecting samples at locations on site where radioactivity or chemical pollutants are (or might be) released. Release points include discharge outfalls, storm water outfalls, site drainage points, and plant ventilation stacks. The WVDP maintains required permits and/or certificates from regulatory agencies applicable to releases to air and water, as listed in Table ECS-3.

Environmental Surveillance. Surface water, drinking water, air, sediment, soil, venison, fish, and milk are collected at locations where the highest concentrations of transported contaminants might be expected. Samples are also collected at remote locations to provide background data for comparison with data from on-site and near-site samples. Direct radiation is monitored on site, at the site perimeter, in nearby communities, and at a remote background location.

Data Evaluation. Data are assessed to determine whether the constituents of interest are present and, if so, at what concentrations. Data from each sampling location are compared with regulatory or guidance limits (if applicable) to determine if any limits have been exceeded. Guidance levels for radiological constituents in air and water are listed in Table UI-4 in the "Useful Information" section of this report. Regulatory limits for nonradiological constituents in discharges to surface water, additional water quality standards and potable water standards are listed in Appendix B-1. Guidance levels for soil and sediment are listed in Appendix F-1.

Data from near-site locations are compared with background concentrations using standard statistical methods as a means of assessing possible site impacts to the environment. Results from each location are also compared with historical data from that location to determine if any trends, such as increasing concentrations of a constituent, are occurring. If indicated, follow-up actions are evaluated and implemented as warranted.

Effluent Monitoring

Liquid Effluents. The Project is drained by several small streams. Franks Creek enters from the south and receives drainage from the south plateau. As it flows northward, Franks Creek is joined by Erdman Brook, which receives effluent from the low-level waste treatment facility (LLW2). After leaving the Project at the site security fence, Franks Creek receives drainage from the north and northeast swamp areas on the north plateau and from Quarry Creek. Franks Creek then flows into Buttermilk Creek, which, after flowing northward through the Western New York Nuclear Service Center (WNYNSC), enters Cattaraugus Creek and leaves the WNYNSC. (See maps on Figs. A-2 and A-5.)

- Radiological Releases

  Two locations, the lagoon 3 weir at outfall 001 (WNSP001 on Fig. A-2) and a natural drainage from the northeast swamp (monitoring point WNSWAMP on Fig. A-2), are the primary sources of radionuclide releases to surface waters. (Note that two other liquid release points, the sewage treatment outfall [point WNSP007] and another drainage point on the north plateau [the north swamp, point WNSW74A] are also evaluated each year. Releases from these points are minor and are not included in this discussion. However, they are addressed in Chapter 3, Dose Assessment.)

The discharge through the lagoon 3 weir at outfall 001 into Erdman Brook is the primary controlled point source of liquid release from the Project. Six batch releases totaling about 10.8 million gallons (40.7 million liters) were discharged from WNSP001 in 2007. Drainage from the northeast swamp in CY 2007 was estimated to be approximately 58.0 million gallons (219 million liters). Estimates of curies released from these two sources in 2007 and average radionuclide concentrations are summarized in Tables 2-1 and 2-2.

DOE Order 5400.5 defines radionuclide concentrations that, under conditions of continuous exposure for one year by one exposure mode, would result in an effective dose equivalent of 100 mrem (1 mSv). These derived concentration guides (DCGs) are applicable only at locations where members of the public could

TABLE 2-1
Total Radioactivity Discharged at Lagoon 3 (WNSP001) in 2007 and Comparison of Concentrations with DOE DCGs

Isotope [a]	*Discharge Activity* [b] *(Ci)*	*Radioactivity* [c] *(Becquerels)*	*Average Concentration (µCi/mL)*	*DCG* [d] *(µCi/mL)*	*Ratio of Concentration to DCG*
Gross Alpha	1.11±0.11E-03	4.12±0.40E+07	2.73±0.26E-08	NA[e]	NA
Gross Beta	1.01±0.02E-02	3.75±0.08E+08	2.49±0.05E-07	NA[e]	NA
H-3	5.27±0.14E-02	1.95±0.05E+09	1.29±0.03E-06	2E-3	0.0006
C-14	-0.52±5.73E-04	-0.19±2.12E+07	-0.13±1.41E-08	7E-5	<0.0002
K-40	-3.17±9.90E-04	-1.17±3.66E+07	-0.78±2.43E-08	NA[f]	NA
Co-60	4.61±3.41E-05	1.71±1.26E+06	1.13±0.84E-09	5E-6	0.0002
Sr-90	3.95±0.07E-03	1.46±0.03E+08	9.71±0.18E-08	1E-6	0.0971
Tc-99	5.68±0.43E-04	2.10±0.16E+07	1.40±0.11E-08	1E-4	0.0001
I-129	6.98±1.76E-05	2.58±0.65E+06	1.71±0.43E-09	5E-7	0.0034
Cs-137	2.42±0.10E-03	8.94±0.36E+07	5.94±0.24E-08	3E-6	0.0198
U-232[g]	2.63±0.10E-04	9.72±0.37E+06	6.46±0.24E-09	1E-7	0.0646
U-233/234[g]	1.72±0.08E-04	6.35±0.31E+06	4.22±0.21E-09	5E-7	0.0084
U-235/236[g]	1.10±0.21E-05	4.08±0.78E+05	2.71±0.52E-10	5E-7[h]	0.0005
U-238[g]	1.57±0.08E-04	5.82±0.30E+06	3.86±0.20E-09	6E-7	0.0064
Pu-238	1.53±0.72E-06	5.66±2.67E+04	3.76±1.77E-11	4E-8	0.0009
Pu-239/240	1.40±0.68E-06	5.19±2.53E+04	3.45±1.68E-11	3E-8	0.0012
Am-241	1.94±0.83E-06	7.17±3.08E+04	4.76±2.05E-11	3E-8	0.0016
Sum of Ratios					**0.205**

NA - Not applicable

[a] Half-lives are listed in Table UI-4.

[b] Total volume released: 4.07E+10 mL (1.08E+07 gal)

[c] 1 curie (Ci) = 3.7E+10 becquerels (Bq): 1Bq = 2.7E-11 Ci

[d] DCGs are listed for reference only. DCGs are applicable at the point at which water is available for ingestion by the public (i.e., at the site boundary) but not to release point concentrations, as might be inferred from their inclusion in this table.

[e] DOE DCGs do not exist for indicator parameters gross alpha and beta.

[f] The DCG is not applied to potassium-40 (K-40) activity because of its natural origin.

[g] Total uranium (g) = 4.70±0.05E+02; average uranium concentration (µg/mL) = 1.15±0.01E-02

[h] The DCG for U-236 is used for this comparison.

TABLE 2-2
Total Radioactivity Released at Northeast Swamp (WNSWAMP) in 2007 and Comparison of Concentrations with DOE DCGs

Isotope [a]	*Discharge Activity* [b] *(Ci)*	*Radioactivity* [c] *(Becquerels)*	*Average Concentration (µCi/mL)*	*DCG* [d] *(µCi/mL)*	*Ratio of Concentration to DCG*
Gross Alpha	1.26±4.12E-04	0.47±1.53E+07	0.58±1.88E-09	NA[e]	NA
Gross Beta	6.44±0.12E-01	2.38±0.05E+10	2.94±0.06E-06	NA[e]	NA
H-3	1.11±0.77E-02	4.12±2.86E+08	5.07±3.52E-08	2E-03	<0.0001
C-14	-5.39±6.91E-03	-1.99±2.56E+08	-2.46±3.15E-08	7E-05	0.0005
Sr-90	3.43±0.02E-01	1.27±0.01E+10	1.56±0.01E-06	1E-06	1.56
I-129	-0.26±1.00E-04	-0.97±3.72E+06	-1.19±4.58E-10	5E-07	0.0009
Cs-137	0.57±2.09E-04	2.09±7.74E+06	2.57±9.54E-10	3E-06	0.0003
U-232[f]	0.66±1.35E-05	2.45±4.98E+05	3.01±6.13E-11	1E-07	0.0006
U-233/234[f]	4.62±1.95E-05	0.17±7.22E+05	2.11±0.89E-10	5E-07	0.0004
U-235/236[f]	0.95±1.14E-05	3.53±1.23E+05	4.35±5.22E-11	5E-07	0.0001
U-238[f]	3.61±1.67E-05	0.13±6.18E+05	1.64±0.76E-10	6E-07	0.0003
Pu-238	0.00±1.24E-05	0.03±4.58E+05	0.04±5.65E-11	4E-08	0.0014
Pu-239/240	0.66±1.24E-05	2.46±4.58E+05	3.03±5.65E-11	3E-08	0.0019
Am-241	1.13±2.63E-06	4.18±9.75E+04	0.52±1.20E-11	3E-08	0.0004
Sum of Ratios					**1.57**

NA - Not applicable

[a] Half-lives are listed in Table UI-4.

[b] Total volume released: 2.19E+11 mL (5.80E+07 gal)

[c] 1 curie (Ci) = 3.7E+10 becquerels (Bq): 1Bq = 2.7E-11 Ci

[d] DCGs are listed for reference only. DCGs are applicable at the point at which water is available for ingestion by the public (i.e., at the site boundary) but not to release point concentrations, as might be inferred from their inclusion in this table.

[e] DOE DCGs do not exist for indicator parameters gross alpha and beta.

[f] Total uranium (g) = 6.67±0.38E+01; average uranium concentration (µg/mL) = 3.04±0.18E-04

[g] The DCG for U-236 is used for this comparison.

be exposed to effluents containing contaminants. DCGs for radionuclides measured at the WVDP are listed in Table UI-4. Note that DCGs are not used for dose assessment. Methods for estimating dose from the liquid pathway are discussed in Chapter 3.

To evaluate each of the releases with respect to the DCGs, each annual average radionuclide concentration was divided by its respective DCG and the fractions from all nuclides were summed. As a DOE policy, the sum of the fractions should not exceed 1.0. That is, the sum of percentages should not exceed 100%. Tables 2-1 and 2-2 list the sum of fractions for each release point.

The sum of fractions for the release from WNSP001 in 2007 was about 0.205, well below the 1.0 criterion. However, the sum of fractions from WNSWAMP was 1.57, above the DOE Order 5400.5 criterion. Drainage at this point largely consists of emergent groundwater. Elevated gross beta concentrations were first noted at this location in 1993. Subsequent investigations delineated a plume of strontium-90 contaminated groundwater on the north plateau. Annualized average strontium-90 concentrations, which first exceeded the strontium-90 DCG (1E-06 µCi/mL) in 1995, continued to exceed the DCG through 2007. (See Fig. 4-6 in Chapter 4, "Groundwater Protection Program".) Ongoing activities to characterize and remediate the strontium-90 groundwater plume are discussed in Chapter 4.

Even though waters with elevated strontium-90 concentrations drain from WNSWAMP into Franks Creek, then into Buttermilk Creek, and ultimately into Cattaraugus Creek, concentrations in water collected from Cattaraugus Creek downstream of the WVDP at the first point of public access continue to show little difference from background concentrations. (See Table B-5A in Appendix B-5.)

State Pollutant Discharge Elimination System (SPDES) Permit-Required Monitoring. Liquid discharges from the WVDP are regulated for nonradiological constituents under a SPDES permit, as identified in Table ECS-3. The permit identifies compliance points from which liquid effluents are released to Erdman Brook (Fig. A-2), identifies 20 storm water outfalls (Figs. A-3 and A-4) and specifies the sampling and analytical requirements for each.

The conditions and requirements of the SPDES permit are summarized in Appendix B-1. The permit identifies 25 outfalls and compliance points with monitoring requirements and discharge limits. The monitored outfalls include:

- outfall 001 (monitoring point WNSP001), discharge from the low-level waste treatment facility (LLW2)
- outfall 007 (monitoring point WNSP007), discharge from the sanitary and industrial wastewater treatment facility
- outfall 008 (monitoring point WNSP008), a groundwater french drain around the perimeter of the LLWTF storage lagoons (closed in May 2001 but still on the permit)
- outfall 116 (pseudo-monitoring point WNSP116), a location in Franks Creek that represents the confluence of outfalls WNSP001, WNSP007, and WNSP008, as well as storm water runoff, groundwater seepage, and augmentation water. Samples from upstream sources are used to calculate total dissolved solids (TDS) at this location and to demonstrate compliance with the SPDES permit limit for this parameter. (Outfall 116 is referred to as a "pseudo-monitoring" point on the SPDES permit.)
- outfall 01B (monitoring point WNSP01B), an internal monitoring point for the liquid waste treatment system evaporator effluent, being monitored for flow and total mercury.
- 20 storm water discharge outfalls that also receive flows from other minor sources, such as fire hydrant testing and groundwater seepage, being monitored on a rotational basis. The objectives of SPDES permit requirements for monitoring storm water runoff are to determine (1) the levels of water quality and specific chemicals in storm water discharges from specified locations on the WVDP, (2) the amount of rainfall, (3) duration of the storm event, and (4) the resulting flow at the outfalls. The 20 storm water outfalls at the WVDP are grouped into eight representative drainage basins that could potentially be influenced by industrial or construction activity runoff. One representative outfall for each of the eight outfall groups listed in Appendix A must be sampled on a semiannual basis.

The SPDES permit recommends the following guidelines for a qualifying storm water event eligible for monitoring: (1) a period of 72 hours between the monitored event and the previous measurable event of 0.1 inches of precipitation; (2) a total rainfall of more than 0.1 inch; (3) resultant storm discharge at the outfall.

Appendix B-2 presents process effluent data with SPDES permit limits provided for comparison with these data. Appendix B-3 presents storm water runoff monitoring data for storm water outfalls designated in the WVDP SPDES permit.

In CY 2007, all samples were collected and analyzed in accordance with requirements of the permit. No SPDES effluent limits were exceeded.

Radiological Air Emissions. Federal law allows air containing small amounts of radioactivity to be released from plant ventilation stacks during normal operations. The releases must meet dose criteria specified in the National Emission Standards for Hazardous Air Pollutants (NESHAP) regulations to ensure that public health and safety and the environment are protected. At the WVDP, radiological releases are measured and/or estimated from six permitted emission points (see Table ECS-3), five non-permitted points, and three diffuse sources (wastewater storage lagoons, stored waste containers, and demolition activities). Sampling locations for air emissions are shown in Appendix A on Figure A-6. Releases are evaluated and reported to the U.S. Environmental Protection Agency (EPA) in an annual NESHAP report.

Measured radionuclide concentrations in air are also compared with DOE DCGs. Unlike NESHAP dose criteria, the DOE DCGs are expressed in units of microcuries per milliliter (µCi/mL) and can be directly compared with measurements from the monitoring program. Although the DOE DCGs are applicable only where the public may breathe air containing radionuclides, the DCGs are used at the WVDP as a tool for evaluating airborne emissions at the point of release. DCGs for radionuclides of interest at the WVDP are found in Table UI-4 in the "Useful Information" section at the end of this report. When only gross alpha and beta measurements are available, activity is assumed to come from americium-241 and strontium-90, respectively, because the DCGs for these radionuclides are the most limiting for major particulate emissions at the WVDP.

Ventilation and Emission Systems. The exhaust from each EPA-permitted ventilation system is continuously filtered and the permanent systems are monitored as air is released to the atmosphere. Because radionuclide concentrations in air emissions are quite low, a large volume of air must be sampled to measure the quantities of radionuclides released from the facility. Emissions are sampled for radioactivity in both particulate forms (e.g., strontium-90 and americium-241) and gaseous forms (e.g., tritium and iodine-129). The total release of each radionuclide varies from year to year in response to changing site activities. For instance, releases of iodine-129 dropped sharply after vitrification was completed. Over the years, annual calculated dose from air emissions at the WVDP has remained a small fraction of the NESHAP standard. (See "Predicted Dose From Airborne Emissions" in Chapter 3.)

- The Main Plant Ventilation Stack

  The primary controlled air emission point at the WVDP is the main plant process building (MPPB) ventilation stack, monitoring location code ANSTACK, which vents to the atmosphere at a height of approximately 200 feet (ft) (more than 60 meters [m]). This stack has historically released ventilation exhaust from several facilities, including the liquid waste treatment system, the analytical laboratories, and off-gas from the former vitrification system. In 2007, the main plant stack continued to release ventilation exhaust from a variety of main plant spaces.

  Total curies released from the main stack in 2007 are listed in Table 2-3, together with annual averages, maxima, and a comparison of average isotopic concentrations with the applicable DCGs. The sum of fractions for radiological concentrations from ANSTACK was 0.025, far below the DOE guideline of 1.0. Airborne concentrations from the stack to the site boundary were further reduced by dispersion. Results from air samples taken near the site boundary confirm that WVDP operations had no discernible effect on off-site air quality. (See "Ambient Air," later in this chapter.)

- Other On-Site Air Sampling Systems

  Sampling systems similar to those of the MPPB are used to monitor airborne effluents from the former vitrification heating, ventilation, and air-conditioning system (ANVITSK), the 01-14 building ventilation stack (ANCSSTK), the contact size-reduction facility ventilation stack (ANCSRFK), the supernatant treatment system ventilation stack (ANSTSTK), the container sorting and packaging facility ventilation stack (ANCSPFK), and the remote-handled waste facility (ANRHWFK) (Fig. A-6).

  Permitted portable outdoor ventilation enclosures (OVEs) are used to provide the ventilation necessary for the safety of personnel working with radioactive materials in areas outside permanently ventilated facilities or in areas where permanent ventilation must be augmented. Air samples from OVEs are collected continuously while emission points are discharging, and data from these portable ventilation units are included in annual evaluations of airborne emissions.

  One ambient air sampler continued operating on site in 2007 to monitor air near the lag storage area (ANLAGAM) (Fig. A-6). This sampler was put in place to monitor potential diffuse releases of radioactivity.

  Appendix C presents total radioactivity released for specific radionuclides at each of the on-site air sampling locations, with the exception of ANCSRFK, which did not operate in 2007.

  No results exceeding the DOE DCGs were noted at any of the air emission sampling locations. Most results showed no detectable radioactivity.

- Nonradiological Air Emissions

  Nonradiological air emissions at the WVDP are regulated under an air facility registration certifi-

TABLE 2-3
Total Radioactivity Released at Main Plant Stack (ANSTACK) in 2007 and Comparison of Concentrations with DOE DCGs

Isotope [a]	*N*	*Total Activity Released* [b] *(Ci)*	*Average Concentration (µCi/mL)*	*Maximum Concentration (µCi/mL)*	*DCG* [c] *(µCi/mL)*	*Ratio of Concentration to DCG*
Gross Alpha	26	5.90±0.67E-07	7.95±0.91E-16	1.89E-15	NA[e]	NA
Gross Beta	26	1.28±0.02E-05	1.73±0.03E-14	7.11E-14	NA[e]	NA
H-3	26	2.07±0.04E-03	2.79±0.01E-12	1.60E-11	1E-07	<0.0001
Co-60	2	2.89±3.72E-08	3.90±5.02E-17	<6.45E-17	8E-11	<0.0001
Sr-90	2	2.25±0.16E-06	3.04±0.21E-15	4.02E-15	9E-12	0.0003
I-129	2	2.72±0.21E-05	3.66±0.28E-14	3.75E-14	7E-11	0.0005
Cs-137	2	4.56±0.26E-06	6.14±0.35E-15	6.47E-15	4E-10	<0.0001
Eu-154	2	-0.03±1.23E-07	-0.04±1.65E-16	<2.40E-16	5E-11	<0.0001
U-232[d]	2	4.77±4.99E-09	6.42±6.73E-18	9.65E-18	2E-14	<0.0003
U-233/234[d]	2	2.54±0.74E-08	3.42±1.00E-17	3.93E-17	9E-14	0.0004
U-235/236[d]	2	6.99±4.09E-09	9.42±5.51E-18	9.27E-18	1E-13	<0.0001
U-238[d]	2	1.81±0.69E-08	2.43±0.93E-17	2.31E-17	1E-13	0.0002
Pu-238	2	5.00±1.23E-08	6.73±1.65E-17	6.20E-17	3E-14	0.0022
Pu-239/240	2	9.67±1.64E-08	1.30±0.22E-16	1.61E-16	2E-14	0.0065
Am-241	2	2.08±0.21E-07	2.80±0.29E-16	3.43E-16	2E-14	0.014
Sum of Ratios						**0.025**

N - Number of samples
NA - Not applicable
[a] Half-lives are listed in Table UI-4.
[b] Total volume released at 50,000 cubic feet per minute: 7.42E+14 mL
[c] 1 curie (Ci) = 3.7E+10 becquerels (Bq): 1Bq = 2.7E-11 Ci
[d] DCGs are listed for reference only. DCGs are applicable at the point at which air could be inhaled by the public (i.e., at the site boundary) but not to release point concentrations, as might be inferred from their inclusion in this table.
[e] DOE DCGs do not exist for indicator parameters gross alpha and beta.
[f] The DCG is not applied to potassium-40 (K-40) activity because of its natural origin.
[g] Total uranium (g) = 3.14±0.15E-02; average uranium concentration (µg/mL) = 4.23±0.21E-11
[h] The DCG for U-236 is used for this comparison.

cate that includes a cap, which limits the nitrogen and sulfur oxide emissions from the facility to 99 tons per year. (See Table ECS-3.) The WVDP certificate applies 50% of the capping limit (i.e., 49.5 tons) for each. Two site utility steam boilers are left as the only remaining sources of nitrogen and sulfur oxides. During 2007, approximately 1,611 kilograms (1.8 tons) of nitrogen oxides and 0.56 kilogram (0.00062 ton) of sulfur dioxide were emitted from these units. These releases comprised about 3.6% and 0.0013%, respectively, of the 49.5-ton capping limit for each.

Environmental Surveillance

Surface Water. On-site surface water drainage is routinely sampled at several points on the north and south plateaus, as shown in Appendix A, Figure A-2. Monitoring points are sited at locations where releases from possible source areas on the south and north plateaus could be detected.

- South Plateau

Two inactive underground radioactive waste disposal areas, the Nuclear Regulatory Commission (NRC)-Licensed Disposal Area (NDA) and the New

York State-Licensed Disposal Area (SDA) lie on the south plateau. These disposal sites are possible sources of contaminants to surface water. Also located on the south plateau is the drum cell, formerly used to store approximately 20,000 drums of processed low-level radioactive waste. During 2007, shipment of drums to an off-site facility was completed and the drum cell is now empty. Areas of the south plateau are being used to store radioactive vessels removed from site facilities and to temporarily store radioactive waste containers and stage them for shipment.

At the NDA interceptor trench, samples are collected from a sump at the lowest point in the collection trench system that intercepts groundwater from the northeastern and northwestern sides of the NDA (interceptor trench at sampling point WNNDATR). Water collected underground at this location is pumped to the LLWTF for treatment prior to discharge at outfall WNSP001. If contamination were to migrate through the NDA, it would most likely be first detected at the interceptor trench.

Surface water drainage downstream of the NDA is also monitored at point WNNDADR and at Erdman Brook (point WNERB53), before it joins with drainage from the MPPB and lagoon areas. Some drainage from western and northwestern portions of the SDA is also captured at these sampling points.

Although strontium-90 and associated gross beta results at all three locations were elevated with respect to background concentrations from Buttermilk Creek (WFBCBKG), all were below the strontium-90 DCG. Residual soil contamination from past waste burial activities is thought to be the source of the strontium-90 activity. The NDA is thought to be the predominant source of gross beta activity observed at WNNDATR.

Tritium concentrations have generally decreased over time at both WNNDATR and WNNDADR. Since the half-life of tritium is slightly longer than 12 years, decreasing tritium concentrations may be partially attributable to radioactive decay.

Immediately south of the SDA, Franks Creek was sampled to monitor surface drainage from the area around the drum cell (point WNDCELD, on Fig. A-2). To the north of the SDA, Franks Creek is again sampled to monitor drainage downstream of the drum cell and the eastern and southern borders of the SDA (point WNFRC67).

- North Plateau

  Besides the effluent and drainage locations discussed earlier in the liquid effluents section, additional monitoring locations on the north plateau include drainage and groundwater seepage on the east side of the MPPB (point WNSP005) and coolant water from a contained basin within the facility (point WNCOOLW).

  On the north plateau, possible sources of contamination to surface water include the high-level waste tanks, process buildings, the lagoon system associated with the LLW2, and facilities for handling and storing wastes.

  Appendices B-4 through B-6 present data for subsurface drainage water, contained water, ambient surface water, and potable water monitoring locations. Also provided for side-by-side comparison with these data are reference values, where available, including background ambient water monitoring data and/or pertinent ambient water quality standards (AWQS), guidelines, or maximum contaminant levels (MCLs).

- Off-Site Surface Water

  Surface water samples are collected at four off-site locations, upstream background locations and downstream locations on both Buttermilk Creek and Cattaraugus Creek. Sampling locations are shown on Fig. A-5. Results are presented in Appendix B-5.

  – Buttermilk Creek at Fox Valley Road and Thomas Corners Bridge is the major surface drainage from the WNYNSC. The background monitoring point is located upstream of the WVDP at Fox Valley Road (WFBCBKG) and the downstream point is located at Thomas Corners Bridge (WFBCTCB), just before Buttermilk Creek enters Cattaraugus Creek.

  – Background samples are collected at Cattaraugus Creek at Bigelow Bridge (WFBIGBR) before the point where Buttermilk Creek flows into Cattaraugus Creek. Downstream of that point, samples are collected at Felton Bridge (WFFELBR), the first point of public access below the WVDP.

Radiological and nonradiological results from surface water samples were compared with applicable water quality standards and guidelines. Results

TABLE 2-4
2007 Comparison of Environmental Monitoring Results with Applicable Limits and Backgrounds

Sample Type	*Number of Sampling Locations*	*Locations with Results Greater than Applicable Limits or Screening Levels[a] (Constituent)*	*Number of Locations with Results Greater Than Background*	*Locations with Results Statistically Greater than Background (Constituent)*
Air (1 background location)				
On-site air emission points	7	0	4	**ANSTACK** (tritium, strontium-90, iodine-129, cesium-137, plutonium-238, plutonium-239/240, americium-241); **ANSTSTK** (iodine-129); **ANCSPFK** (iodine-129); **ANRHWFK** (iodine-129)
On-site ambient air points	1	0	0	None
Off-site ambient air points	5	0	0	None
Surface water (2 background locations, one on Buttermilk Creek and one [historical] on Cattaraugus Creek)				
On-site controlled effluents	2	0	2	**WNSP001** (gross alpha, gross beta, tritium, strontium-90, technetium-99, iodine-129, cesium-137, uranium-232, uranium-233/234, uranium-235/236, uranium-238, bromide, sulfate, total dissolved solids); **WNSP007** (gross beta)
On-site surface water	10	**WNSWAMP** (strontium-90, total iron[b]); **WNSP006** (total iron[b], total dissolved solids, alpha-BHC)	7	**WNSP006** (gross beta, strontium-90, cesium-137, uranium-233/234, uranium-238, chloride, total sodium); **WNSP005** (gross beta, strontium-90); **WNSWAMP** (gross beta, tritium, strontium-90, bromide); **WNSW74A** (gross beta, strontium-90, nonpurgeable organic carbon, total dissolved solids); **WNNDADR** (gross beta, tritium, strontium-90); **WNNDATR** (gross alpha, gross beta, tritium, strontium-90); **WNERB53** (gross beta, strontium-90)
Off-site surface water	2	**WFBCTCB** (total iron[b])	2	**WFBCTCB** (gross beta, chloride, total sodium); **WFFELBR** (gross beta)

Note: DOE derived concentration guides for water and air are listed in Table UI-4 of the "Useful Information Section of this report.

[a] Applicable regulatory, guidance, or screening limits for each matrix are listed in Appendices B and F at the beginning of the data tables for water (Appendix B) and soil and sediment (Appendix F).

[b] Background location WFBCBKG also exceeded the water quality standard for iron.

TABLE 2-4 *(concluded)*
2007 Comparison of Environmental Monitoring Results with Applicable Limits and Backgrounds

Sample Type	*Number of Sampling Locations*	*Locations with Results Greater than Applicable Limits or Screening Levels [a] (Constituent)*	*Number of Locations with Results Greater Than Background*	*Locations with Results Statistically Greater than Background (Constituent)*
Standing water (1 historical background location [no longer sampled])				
Standing water	1	0	0	None
Drinking water (2 background locations, one on site and one off site)				
On-site drinking water	3	0	0	None
Off-site drinking water	9	NS	NS	NS
Soil (1 background location)				
Off-site soil	5	0	2	**SFFXVRD** (cesium-137); **SFRSPRD** (cesium-137)
Sediment (2 background locations, one on Buttermilk Creek and one [historical] on Cattaraugus Creek)				
On-site sediment/soil	3	**SNSWAMP** (strontium-90, cesium-137, arsenic, silver, zinc), **SNSP006** (arsenic, manganese, nickel, silver), **SNSW74A** (calcium, magnesium, selenium, zinc)	3	**SNSWAMP** (gross alpha, gross beta, strontium-90, cesium-137, plutonium-238, plutonium-239/240, americium-241); **SNSP006** (gross beta, strontium-90, cesium-137, plutonium-239/240); **SNSW74A** (strontium-90, cesium-137, plutonium-239/240)
Off-site sediment	3	0	3	**SFTCSED** (cesium-137); **SFSDSED** (cesium-137, uranium-238); **SFCCSED** (cesium-137)
Biologicals (3 background deer; 1 background per matrix for remainder)				
Fish	2	NA	0	None
Milk	3	NA	0	None
Deer	3	NA	1	**BFDNEAR** (cesium-137)
Vegetables/ fruits	3	NA	0	None
Environmental dosimetry (1 background)				
On-site, near facilities	14	NA	10	**DNTLDs #24, 26, 28, 33, 35, 36, 38, 39, 40, 43**
Perimeter	17	NA	0	None
Communities	2	NA	0	None

NA - No regulatory, guidance, or screening limits are available for these matrices.
NS - Not sampled in 2007.
[a] Applicable regulatory, guidance, or screening limits for each matrix are listed in Appendices B and F at the beginning of the data tables for water (Appendix B) and soil and sediment (Appendix F).

from on-site and downstream locations on Franks and Buttermilk Creeks were compared with results from the background location on Buttermilk Creek, upstream of the WVDP. Results near Felton Bridge over Cattaraugus Creek (sampling point WFFELBR, the first point of public access to surface water downstream of the Project), were compared with results from the Cattaraugus Creek background at Bigelow Bridge (sampling point WFBIGBR). Results exceeding applicable limits and those statistically greater than background values are summarized in Table 2-4.

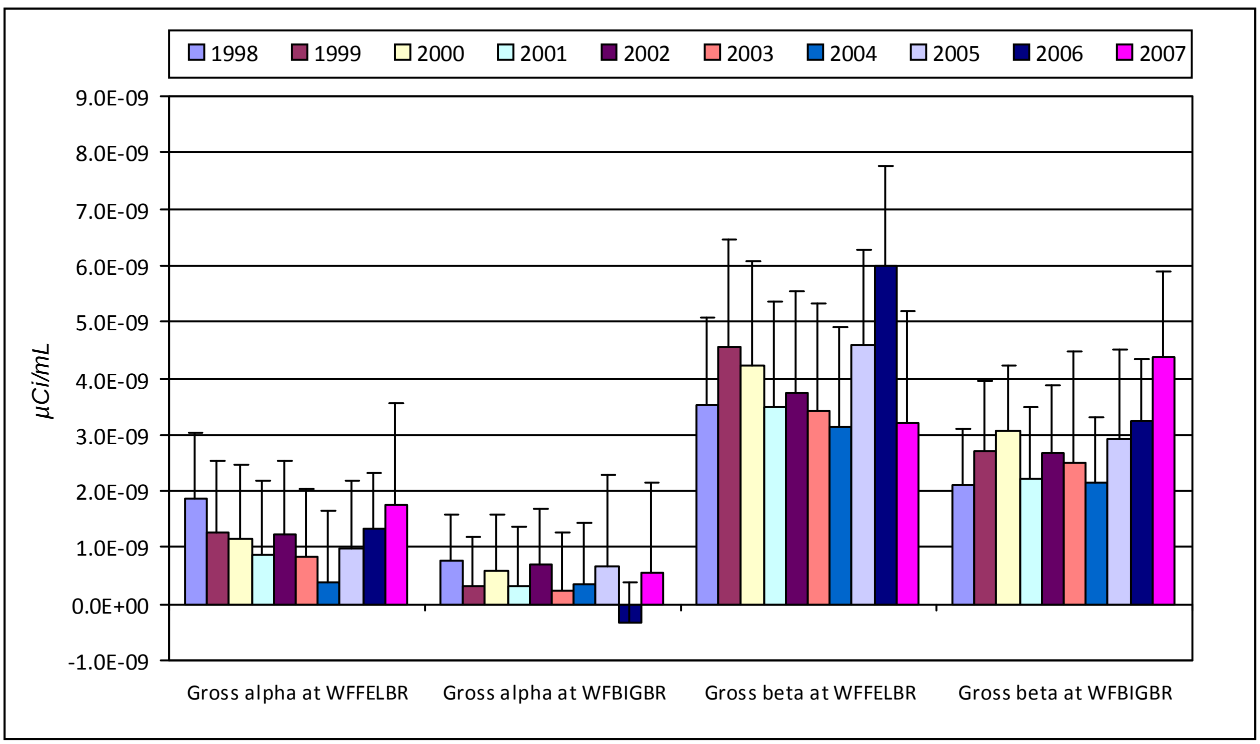
Applicable guidance levels were exceeded at three (of 14) surface water monitoring locations affected by the WVDP in 2007.

The New York State (NYS) Class C and D water quality limit for total iron, 0.3 milligrams per liter (mg/L), was exceeded at locations WNSWAMP, WNSP006, and WFBCTCB, with concentrations of 1.00, 2.00, and 0.5 mg/L, respectively. However, the limit was also exceeded at background location WFBCBKG, with a concentration of 0.44 mg/L. These fluctuating elevated levels are thought to reflect natural variability of stream conditions, not related to activities at the WVDP. The NYS Class C water quality limits for alpha-hexachlorocyclohexane (alpha-BHC) (0.000002 mg/L) and total dissolved solids (500 mg/L) were exceeded at point WNSP006, with maximum concentrations of 0.000017 and 1,332 mg/L, respectively.

A DOE DCG was exceeded at the northeast swamp (WNSWAMP), where the average strontium-90 concentration was 1.56E-06 µCi/mL. (The strontium-90 DCG is 1E-06 µCi/mL.)

Consistent with historical data, concentrations of radiological constituents above background values, usually gross beta and strontium-90, were noted at several on-site surface water monitoring locations. However, results from samples taken downstream at the first point of public access were usually statistically indistinguishable from background or, as with gross beta concentrations, only slightly higher than background, indicating little Project influence downstream.

FIGURE 2-1
Ten-Year Average Gross Alpha and Gross Beta Concentrations in Cattaraugus Creek Downstream of the WVDP at Felton Bridge and Upstream at Background Location Bigelow Bridge



Note: All tritium averages were non-detects, so tritium was not included in this plot. The upper limit of the uncertainty term for the result is indicated with each point.

See Figure 2-1 for a plot comparing average gross alpha and gross beta concentrations in Cattaraugus Creek at WFFELBR with those at background point WFBIGBR over the last 10 years. Although relative concentrations vary from year to year, in general, downstream results are only slightly higher than background. The highest average gross beta result at WFFELBR over the last 10 years (5.99E-09 µCi/mL in 2006) was only about 0.6% of the DOE DCG for strontium-90 (1E-06 µCi/mL). The average result in 2007 was about 0.3% of the DOE DCG.

Drinking Water. Project drinking water (potable water) and utility water is drawn from two on-site surface water reservoirs and is sampled for both radiological and nonradiological constituents. It is monitored at the distribution entry point (WNDNKUR) and at other site tap water locations to verify compliance with EPA and New York State Department of Health (NYSDOH) regulations. Results from 2007 indicated that no radiological contaminants were found in on-site drinking water and that the Project's drinking water continued to remain below the MCLs and drinking water standards of the EPA, NYSDOH, and the Cattaraugus County Health Department. The results are presented in Appendix B-6.

Nine off-site private residential wells near the WVDP and a tenth background well south of the Project have been routinely sampled for more than 16 years. These wells represent the closest unrestricted use of groundwater near the Project. None of the wells draw from geologic units underlying the site.

In 2005, the sampling frequency for near-site private wells was reduced from annually to once every other year. Near-site wells were last sampled in 2006. Results from 2006 (as well as results from the preceding 15 years) showed no contamination associated with the WVDP. Only the background well was sampled in 2007 (See Table B-6A). As part of an evaluation and streamlining of the monitoring program conducted in late 2007, off-site drinking water monitoring was dropped from the program effective January 2008.

Sediment and Soil. Airborne particulates may be deposited onto soil by wind or precipitation. Particulate matter in streams can adsorb radiological constituents in liquid effluents and settle on the bottom of the stream as sediment. Soils and sediment may subsequently be eroded or resuspended, especially during periods of high winds or high stream flow. The resuspended particles may provide a pathway for radiological constituents to reach humans either directly via exposure or indirectly through the food pathway. In 2007, on-site sediment/soil samples were collected at three locations on the north plateau where drainage has the potential to be contaminated (SNSP006, SNSWAMP, and SNSW74A on Fig. A-2). Off-site sediment samples were collected at one background location on Buttermilk Creek and at two downstream locations, one on Buttermilk and one on Cattaraugus Creek (SFBCSED, SFTCSED, and SFCCSED, respectively, on Fig. A-5). Soil samples were collected at one background and three near-site air sampling locations (Figs. A-5, A-13, and A-14). All samples were analyzed for radiological constituents.

The NRC and the EPA, in a 2002 memorandum of understanding (MOU) pertaining to decommissioning and decontamination of contaminated sites, agreed upon concentrations of residual radioactivity in soil that would trigger consultation between the two agencies. This MOU lists consultation "trigger" levels for contamination in both residential and industrial soil.

In 2006, the NRC, in a decommissioning guidance document (NUREG-1757, Vol. 2, 2006), provided concentration screening values for common radionuclides in soils that could result in a dose of 25 mrem/year. The screening levels and trigger levels for radionuclides found at the WVDP are listed in Table F-1D.

The three on-site sediment/soil samples were also analyzed for metals. Results were compared with concentration screening limits for radiological and nonradiological constituents. (See Appendix F for a listing of screening values and for tables presenting the results from 2007.) Results were also compared with results from background samples. Locations and constituents for which either screening limits or background concentrations were exceeded in 2007 are listed in Table 2-4.

- Radiological Results

  Strontium-90 and cesium-137 screening values in soil (1.76E-06 and 6E-06 µCi/g, respectively) were exceeded in 2007 at location SNSWAMP. Measured concentrations for strontium-90 and cesium-137 were 1.71E-05 and 1.66E-05 µCi/g, respectively. (Note that these limits are applicable to soil rather than sediment; however, the screening values have been applied since the SNSWAMP sample may be partially composed of soil, depending on the meteorological conditions and drainage patterns over the year.) Other screening levels were not exceeded.

When radiological results were compared with background results, most were statistically indistinguishable from background. However, consistent with historic data, radiological concentrations exceeded background concentrations for several constituents at all three on-site sampling locations. To a lesser extent and consistent with historical values, radiological concentrations above background, largely due to cesium-137, were noted in downstream sediment from Cattaraugus Creek. Although values were slightly greater than background, concentrations have remained steady through the past 16 years.

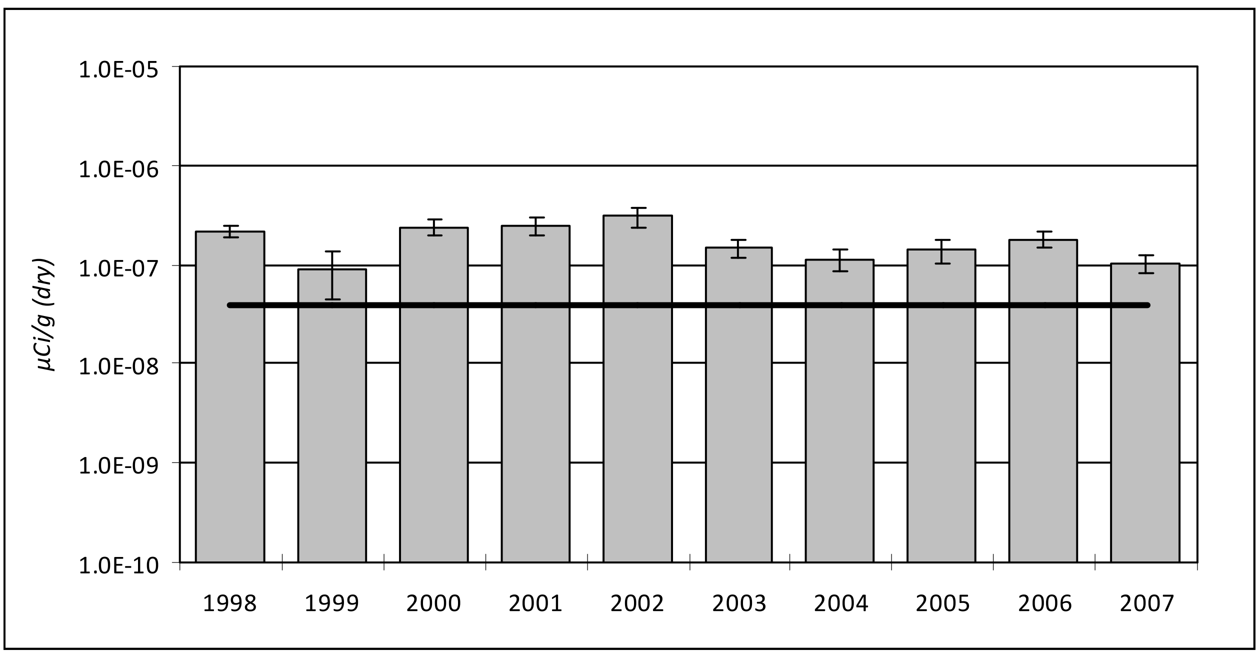
A plot of annual cesium-137 concentrations over 10 years at downstream sampling location SFCCSED is illustrated on Figure 2-2. As the figure indicates, cesium-137 concentrations at SFCCSED, although relatively stable, are consistently higher than the ten-year average cesium-137 concentration at the former background location (SFBISED). Even so, the levels are far lower at these downstream locations than those of naturally occurring gamma emitters, such as potassium-40. (See Table F-2E.)

Also noted in Table 2-4 and consistent with previous years, cesium-137 concentrations slightly above background were found in near-site soil collected at the Rock Springs Road and Fox Valley Road air samplers. Elevated Cs-137 concentrations at the Rock Springs Road location are thought to be attributable to an airborne release during NFS operations in the late 1960s. An area of above-background Cs-137 concentrations observed in soil north and west of the site after this release is referred to as the “cesium prong.”

- Nonradiological Results

Metals results from sediments collected at Franks Creek, near the point at which it leaves the WVDP (SNSP006), were compared with the New York State Department of Environmental Conservation (NYSDEC) screening concentrations for contaminated sediment (See Appendix F-2). All results were below the "Severe Effect Levels" and the "No Appreciable Contaminant Levels," with the exception of silver, which was detected at 2.3 mg/kg, slightly above the "Severe Effect Level" of 2.2 mg/kg. Arsenic, manganese, and nickel were also detected at SNSP006 above the "Low Effect Level" for contaminated sediment. (Levels are based on estimated toxicity to sediment-dwelling biological communities of organisms.)

FIGURE 2-2
Ten-Year Cesium-137 Concentrations in Sediment From Cattaraugus Creek Downstream of the WVDP (SFCCSED) Compared With Historical Average Upstream Concentrations (SFBISED [solid line])



Note: The upper and lower limits of the uncertainty term are plotted with each result.

Metals concentrations at SNSWAMP and SNSW74A were compared with the "Eastern U.S. Background Concentrations for Soil" and the "Remedial Soil Cleanup Objectives" (Appendix F-2). While most metals concentrations were below the guidance limits, a few were exceeded at each location (calcium, magnesium, selenium, and zinc at SNSW74A; arsenic, silver, and zinc at WNSWAMP).

Exceedances may be attributable to localized, naturally elevated concentrations of these metals in soil (e.g., iron, calcium, zinc), application of materials used to treat roads (e.g., magnesium used in deicing salts), or as a result of runoff from industrial activities on site.

Fallout. Fallout samples were collected at the rain gauge outside the Environmental Laboratory (ANRGFOP on Fig. A-6) in 2007 to monitor short-term deposition of radionuclides in rainfall. Results were similar to those from previous years, showing no measurable effects from WVDP emissions.

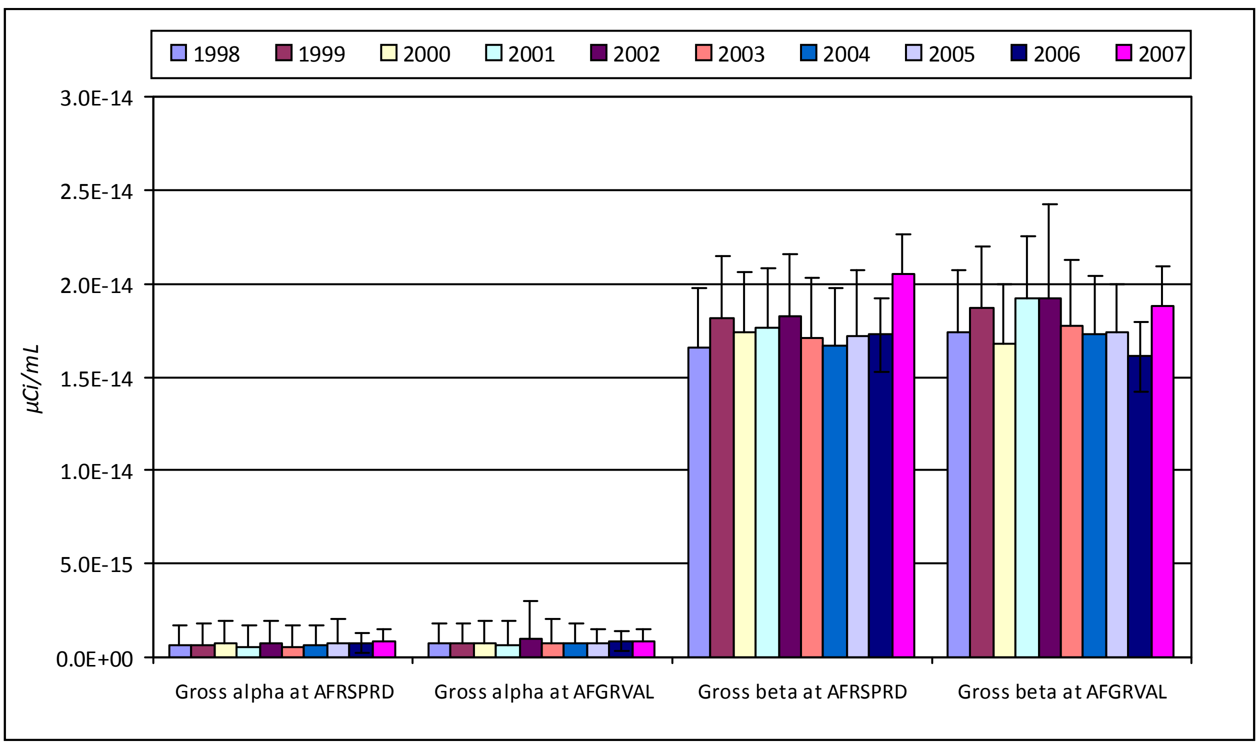
Ambient Air. In 2007, samples for radionuclides in air were collected at one on-site sampler near a waste storage area (ANLAGAM), three locations around the perimeter of the site, and three remote locations.

Near-site perimeter sampling locations at Fox Valley Road (AFFXVRD), Rock Springs Road (AFRSPRD), and Route 240 (AFRT240) were chosen because they provide historical continuity as former Nuclear Fuel Services, Inc. sampling locations or because they represent the most likely locations for detecting airborne radioactivity.

The remote locations provide data from nearby communities (West Valley [AFWEVAL] and Springville [AFSPRVL]) and from a more distant background area (Great Valley [AFGRVAL], 18 miles [29 km] south of the site), which is considered representative of regional background air. Ambient air monitoring locations are shown on maps in Figures A-6, A-7, A-13, and A-14.

Figure 2-3 presents 10-year average gross alpha and gross beta concentrations in ambient air at the Rock Springs Road sampler (AFRSPRD), the nearest off-site

FIGURE 2-3
Ten-Year Average Gross Alpha and Gross Beta Concentrations at Near-Site Ambient Air Sampler AFRSPRD as Compared with Concentrations at Background Air Sampler AFGRVAL, Located 18 Miles (29 km) from the WVDP



Note: The upper limit of the uncertainty term is plotted with each result.

ambient air sampling location, and concentrations from the Great Valley background sampler. Near-site and background concentrations were statistically indistinguishable from each other. Results from other ambient air samplers around the site perimeter and from nearby communities were also statistically indistinguishable from results from background samples, suggesting no evidence of adverse site influence on the quality of ambient air.

Food. Each year food samples are collected from locations near the site (Fig. A-10) and from remote locations (Figs. A-13 and A-14). Fish and deer are collected during periods when they would normally be taken by sportsmen. Corn, apples, and beans are collected annually at the time of harvest. Edible portions are analyzed for radionuclides.

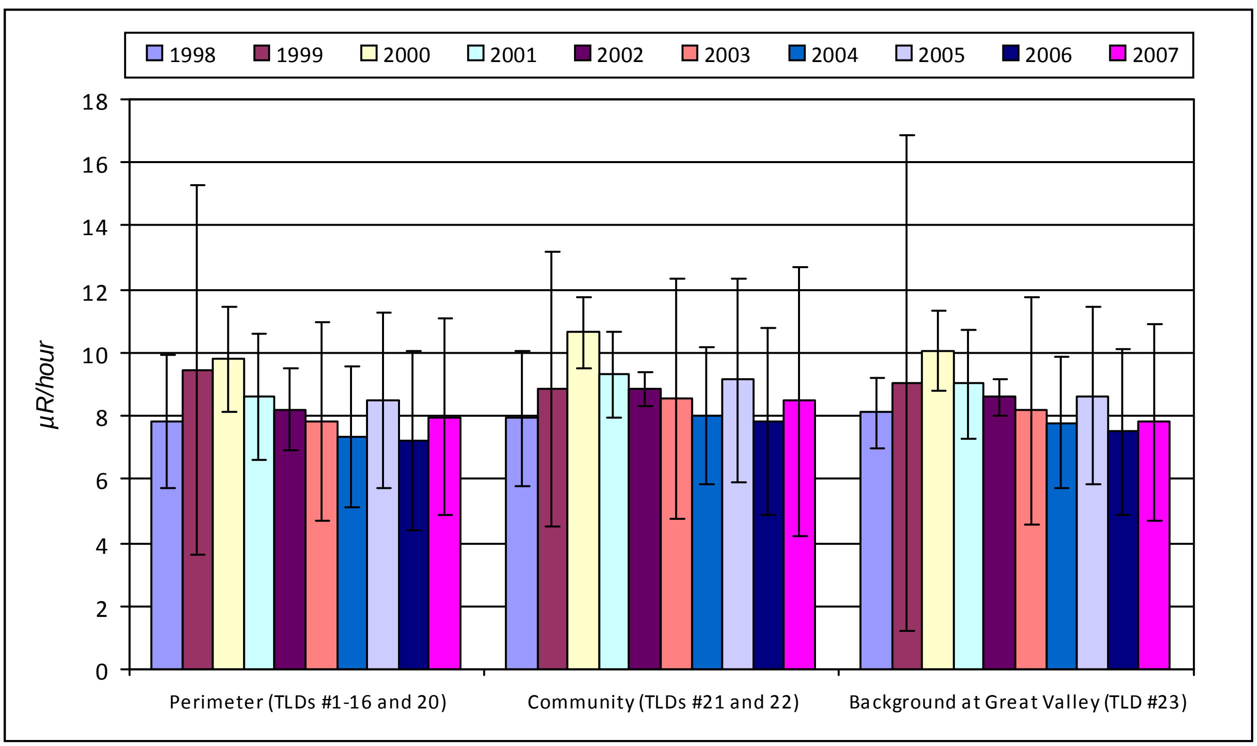
Data have consistently demonstrated that the Project has little or no effect on local food sources. Dose calculations based on results from food sources have consistently confirmed low dose estimates modeled on the basis of results from air and water monitoring. (See Chapter 3, Dose Assessment.)

Locations with results greater than background are listed in Table 2-4. All results were indistinguishable from background in 2007 with the exception of one near-site deer, for which the cesium-137 concentration was above background. Results from this animal were used in the confirmatory dose calculation. (See Chapter 3, "Dose Assessment," "Calculated Dose From Food.")

Environmental Radiation. Thermoluminescent dosimeters (TLDs) are placed on-site at waste management units, at the site security fence, around the WNYNSC perimeter and the access road, at nearby communities, and at a background location remote from the site. These dosimeters directly measure radiation in the environment. TLD measurements were independently confirmed in 2007 by taking a set of measurements with a high-pressure ion chamber, another method of measuring environmental radiation levels, at each TLD location.

Consistent with historical data, results from TLDs located near on-site facilities in 2007 were generally higher than background results, as shown in Table 2-4; these locations are well within the WNYNSC boundary and are not accessible by the public. However, results at perimeter and community locations were statistically the same as results from the back-

FIGURE 2-4
Ten-Year Trends of Environmental Radiation Levels at Perimeter, Community, and Background TLDs



Note: The upper and lower limits of the uncertainty term are plotted with each result.

ground TLDs, indicating no measurable dose from Project activities at these locations. Figure 2-4 presents a graph of annual average exposure rates (in μR/hr) over the last 10 years at background, perimeter, and community locations. As can be seen, results at perimeter and community locations are basically the same as background. In addition, no discernible trends over time are evident.

Meteorological Monitoring. Meteorological monitoring at the WVDP provides representative and verifiable data that characterize the local and regional climatology. These data are used to assess potential effects of routine and nonroutine releases of airborne radioactivity and to provide input to dispersion models used to calculate dose to off-site residents.

The on-site 197-ft (60-m) meteorological tower (Figure A-1) continuously monitors wind speed, wind direction, and temperature at both the 197-ft (60-m) and 33-ft (10-m) elevations. Dewpoint and precipitation are also monitored at the on-site tower. Precipitation in 2007 totaled approximately 40.1 inches (102 cm), essentially equal to the long-term annual average. (See Table 2-5.) Barometric pressure is measured with instrumentation located in the Environmental Laboratory.

TABLE 2-5
WVDP 2007 Monthly Precipitation Totals Compared With 10-Year Monthly Averages

Month	*Monthly Total*	*Ten-Year Monthly Average (1997 to 2006)*
January	4.99	3.22
February	2.28	2.09
March	3.40	2.73
April	2.91	3.04
May	0.87	3.41
June	1.90	3.57
July	4.72	3.90
August	2.16	3.57
September	3.06	3.64
October	2.99	3.43
November	5.65	3.48
December	5.17	3.30
Total (inches)	40.10	39.38
(Centimeters)	101.854	100.02

In addition, an independent, remote 33-ft (10-m) meteorological station, located approximately 5 miles (8 km) south of the site on a hillcrest on Dutch Hill Road (Figure A-13), continuously monitors wind speed and wind direction. The two towers supply data to the primary digital and analog data acquisition systems located within the Environmental Laboratory. On-site systems are provided with either uninterruptible or standby power backup in the event of site power failures. In 2007, the on–site system data recovery rate (the time valid data were logged versus the total elapsed time) was approximately 97.4%. Documentation, such as meteorological system calibration records, site log books, and analog strip charts, is stored in protected archives.

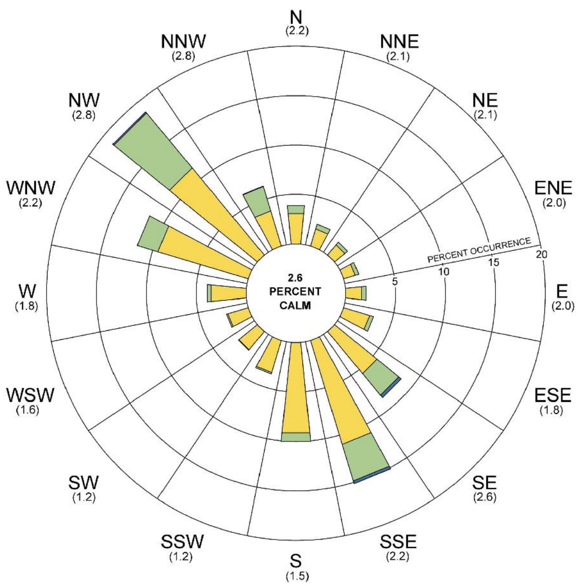
"Wind roses" showing the predominant direction of the wind as measured at the on-site meteorological tower (60-m and 10-m elevations) and at the regional tower (10-m elevation) are shown in Figure 2-5. As shown, wind measurements on-site at the 60-m elevation are predominantly from the west-northwest or south-southeast. Those measured on-site at the 10-m elevation are predominantly from northwest or the south-southeast, apparently influenced by the orientation of the topography around the site. At the regional tower, winds are predominantly from the west-southwest and the west. Wind speeds measured at the on-site 10-m elevation were the lowest, while those from the 60-m on-site tower and the regional tower, located on a hillcrest, were the highest.

Since dispersive capabilities of the atmosphere are dependent upon wind speed, wind direction, and atmospheric stability (which includes a function of the difference in temperature between two elevations), these parameters are closely monitored and are available to the emergency response organization at the WVDP. If a release to the air occurred, meteorological data would be used to predict the direction in which the plume would move.

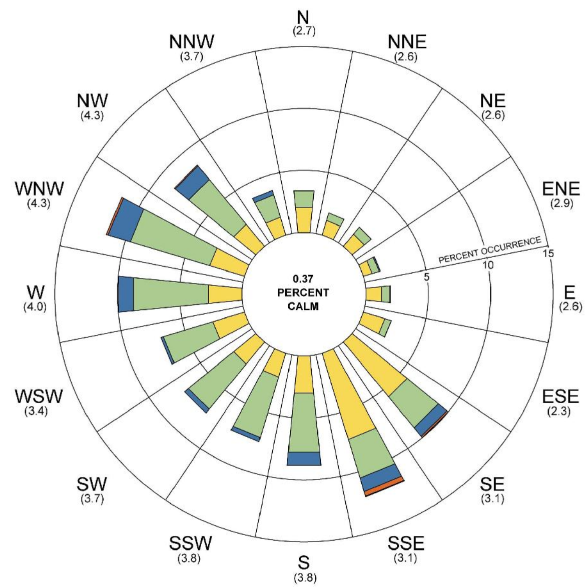
Special Monitoring

Monitoring may be conducted outside the scope of the routine environmental monitoring program to address topics of environmental interest, or as part of investigations or characterizations. Special monitoring efforts conducted in CY 2007 included a hydrogeological evaluation of groundwater in the vicinity of the waste tank farm and sampling for metals as part of characterization of the north plateau (see Chapter 4).

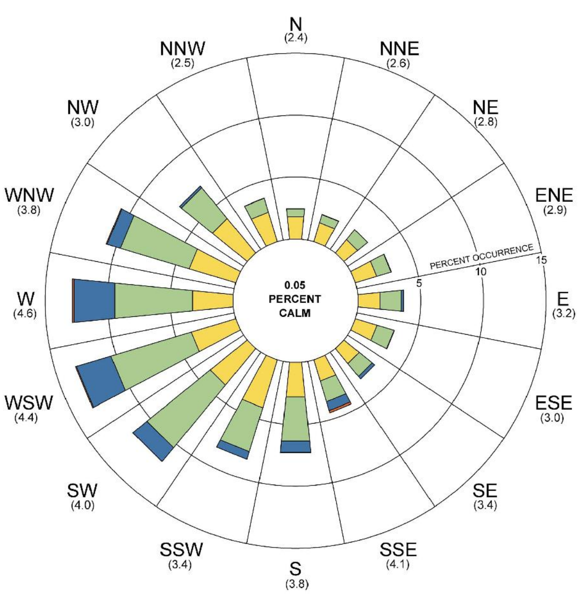
FIGURE 2-5
Wind Frequency and Speed from the On-Site Meteorological Tower (10-m and 60-m Elevations) and from the Regional Meteorological Tower (10-m Elevation), January 1–December 31, 2007



On-Site Meteorological Tower (10-m)



On-Site Meteorological Tower (60-m)



Regional Meteorological Tower (10-m)

Key:

Numbers indicate sector mean wind speed.

Sectors are directions from which the wind is blowing.

Wind Speed Range (m/sec)

- 0.5–3.0
- 3.0–6.0
- 6.0–9.0
- 9.0–12.0
- >12.0

Monitoring Program Changes

Over the last few years, site activities have focused on dismantlement and decontamination of facilities, demolition of unnecessary structures, and processing and shipping of waste. Hazards and potential pollutant sources on site are being reduced. In late 2007, the environmental monitoring program was thoroughly evaluated and changes were identified to streamline the program in response to changing site activities.

Each sampling location was evaluated on several bases: (1) regulatory requirements or legal drivers on which sampling is based, (2) current exposure pathways and hazard conditions, (3) a statistical evaluation of up to 16 years of monitoring data at each location, and (4) a determination of the need for additional data and/or ongoing monitoring for each constituent. As a result, the sampling frequency at some locations was reduced and/or the number of analytical constituents adjusted. At several locations, sampling was discontinued altogether.

Environmental monitoring program modifications were implemented in January of 2008. Specific program changes in CY 2007 and in CY 2008 at each location, with the rationale for the change, are summarized in Appendix A. The maps in Appendix A have been color-coded to show those locations at which sampling has remained unchanged, those locations at which sampling has been reduced, and those locations at which sampling has been discontinued.

Summary

In 2007, no monitoring results exceeded regulatory limits. As in the past, although concentrations of certain radiological and nonradiological constituents from samples collected within the security fence exceeded background or screening concentrations, few results from near-site or downstream locations accessible to the public did.

Monitoring results from CY 2007 continued to demonstrate minimal or no adverse effects of the WVDP on the surrounding environment and confirmed the effectiveness of radiological control measures practiced at the WVDP.

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DOSE ASSESSMENT

Sources of Radiation at the West Valley Demonstration Project (WVDP)

Members of the public are routinely exposed to natural and man-made sources of ionizing radiation. An individual living in the United States (U.S.) is estimated to receive an average annual effective dose equivalent (EDE) of about 360 millirem (mrem) (3.6 millisieverts [mSv]) (National Council on Radiation Protection and Measurements Report 93, 1987). (See the "Useful Information" Section at the end of this report for discussions of ionizing radiation.)

Most of the radiation dose to a member of the public, about 295 mrem/year, is from natural background sources of cosmic and terrestrial origin (Fig. 3-1). The remainder, about 65 mrem/year, is from man-made sources, including diagnostic and therapeutic x-rays, nuclear medicine, consumer products such as cigarettes and smoke detectors, fallout from nuclear weapons tests, and effluents from nuclear facilities.

Radioactive materials at the WVDP are residues from the commercial reprocessing of nuclear fuel by a former site operator in the 1960s and early 1970s. Each year, very small quantities of the radioactive materials remaining at the WVDP are released to the environment. Emissions and effluents are strictly controlled so that release quantities are kept as low as reasonably achievable (ALARA).

Exposure Pathways

An exposure pathway consists of a route for contamination to be transported by an environmental medium from a source to a receptor. Table 3-1 summarizes the potential exposure pathways to the local off-site population and describes the rationale for including or excluding each pathway when calculating dose from the WVDP.

Potential exposure pathways that are considered include: inhalation of gases and particulates, ingestion of locally grown food products and game, and

FIGURE 3-1
Comparison of Doses From Natural and Man-Made Sources to the Dose From 2007 WVDP Effluents

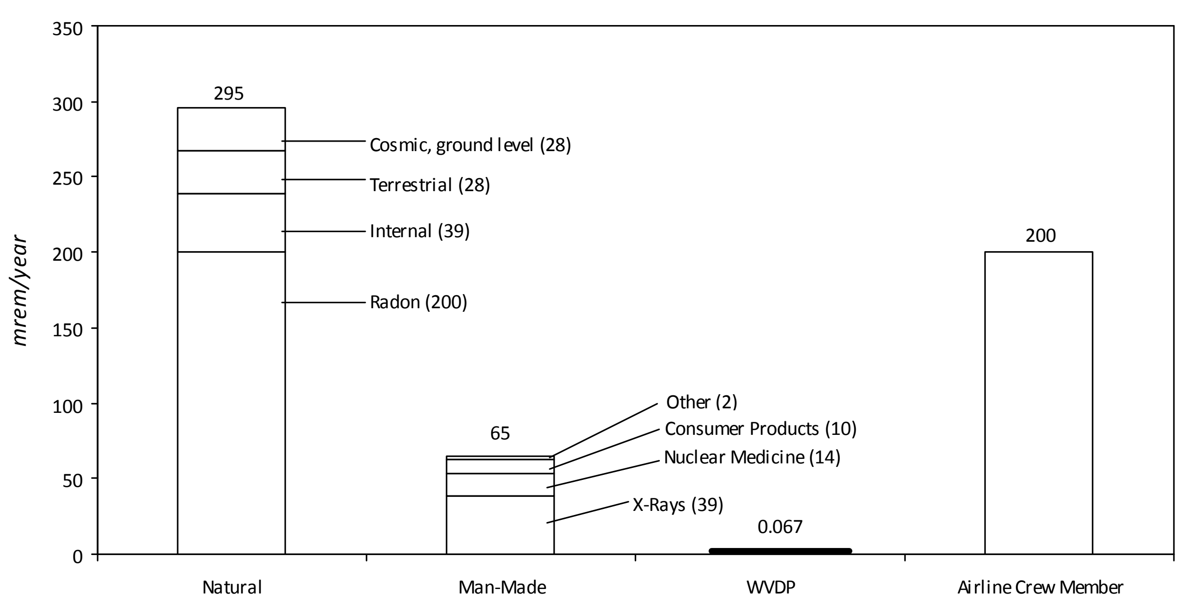


TABLE 3-1
Potential Exposure Pathways from the WVDP to the Local Off-Site Population

Exposure Pathway and Transporting Medium	***Reason for Including/Excluding***
Inhalation of gases and particulates in air (included)	Off-site transport of contaminants from stacks, vents, diffuse sources, or resuspended particulates from soil or water.
Ingestion of vegetables, cultivated crops, venison, milk, and fish (included)	Local agricultural products irrigated with potentially contaminated surface or groundwater; airborne deposition on leaves and uptake of deposited contaminants; venison and milk from animals that have inhaled or ingested contaminants; fish that have been exposed to or ingested contaminants in surface water and sediment.
Ingestion of surface and groundwater (excluded)	No documented use of local surface water or downgradient groundwater wells as drinking water by local residents.
External exposure to radiation from particulates and gases directly from air or surface water or indirectly from surface deposition (included)	Transport of air particulates and gases to off-site receptors; transport of contaminants in surface water and direct exposure when swimming, wading, boating, or fishing.

exposure to external penetrating radiation emitted from contaminated materials. Drinking water is not considered a pathway from the WVDP because surveys have determined that no public water supplies are drawn from downstream Cattaraugus Creek before Lake Erie or from groundwater in aquifers potentially affected by the WVDP.

Land Use Survey

Periodic surveys of local residents provide information about family size, sources of food, and gardening practices. Updated population data from the calendar year (CY) 2000 census was incorporated into WVDP analysis in 2003. Population around the WVDP by sector and distance is presented in Figure A-15. Information from the most recent land use survey, conducted in early 2002, was used to confirm the locations of the residences nearest to the site. This information is required when using computer models for annual dose assessments.

Dose Assessment Methodology

Dose to the public is evaluated using a two-part method consistent with the requirements of the Department of Energy (DOE) Order 5400.5. First, measurements (and/or estimates) of radionuclide concentrations in liquid and air released from the Project are assembled from the calendar year of interest. The U.S. Environmental Protection Agency (EPA)- and DOE-approved models are then used to estimate the EDE to the maximally exposed off-site individual (MEOSI) and the collective EDE to the population within a 50-mile (80 kilometer [km]) radius.

Second, measurements of radioactivity in food from locations near the WVDP boundaries are taken to corroborate the results from the modeled dose calculations. Samples of vegetables, fruit, milk, venison, and fish from the vicinity of the WVDP are collected and analyzed for radiological constituents. Results are compared with similar measurements from samples collected at background locations far from the WVDP. If any near-site results are higher than background results, dose calculations are performed. These results are used as an independent confirmation of (not added to) the computer-modeled dose estimates (Table 3-2) because the models already take into account contributions from all environmental pathways.

Measurement of Radionuclide Concentrations in Liquid and Air Releases. Because it is difficult to distinguish by direct measurement the small amount of radioactivity originating from the Project or from naturally occurring radiation in the environment, computer codes are used to model the environmental dispersion of radionuclides that originate from on-site monitored ventilation stacks and liquid discharge points.

Actual data from air and water release-monitoring samples are collected, together with annual weather measurements and the most recent demographic information. (See Appendices A, B, and C.) The EDE to the MEOSI and the collective EDE to the popula-

Radiation Dose

The energy released from a radionuclide is eventually deposited in matter encountered along the path of the radiation. The radiation energy absorbed by a unit mass of material is referred to as the absorbed dose. The absorbing material can be either inanimate matter or living tissue.

Alpha particles leave a dense track of ionization as they travel through tissue and thus deliver the most dose per unit path-length. However, alpha particles are not penetrating and must be taken into the body by inhalation or ingestion to cause harm. Beta and gamma radiation can penetrate the protective dead skin layer of the body from the outside, resulting in exposure of the internal organs to radiation.

Because beta and gamma radiations deposit much less energy in tissue per unit path-length relative to alpha radiation, they produce fewer biological effects for the same absorbed dose. To allow for the different biological effects of different kinds of radiation, the absorbed dose is multiplied by a quality factor to yield a unit called the dose equivalent. A radiation dose expressed as a dose equivalent, rather than as an absorbed dose, permits the risks from different types of radiation exposure to be compared with each other (e.g., exposure to alpha radiation compared with exposure to gamma radiation). For this reason, regulatory agencies limit the dose to individuals in terms of total dose equivalent.

Units of Dose Measurement

The unit for dose equivalent in common use in the U.S. is the rem. The international unit of dose equivalent is the sievert (Sv), which is equal to 100 rem. The millirem (mrem) and millisievert (mSv), used more frequently to report the low dose equivalents encountered in environmental exposures, are equal to one-thousandth of a rem or sievert, respectively. Other radioactivity unit conversions are found in the “Useful Information” section at the back of this report.

The effective dose equivalent (EDE), also expressed in units of rem or sievert, provides a means of combining unequal organ and tissue doses into a single “effective” whole body dose that represents a comparable risk probability. The probability that a given dose will result in the induction of a fatal cancer is referred to as the risk associated with that dose. The EDE is calculated by multiplying the organ dose equivalent by the organ-weighting factors developed by the International Commission on Radiological Protection (ICRP) in Publications 26 (1977) and 30 (1979). The weighting factor is a ratio of the risk from a specific organ or tissue dose to the total risk resulting from an equal whole body dose. All organ-weighted dose equivalents are then summed to obtain the EDE.

The dose from internally deposited radionuclides calculated for a fifty-year period following intake is called the fifty-year committed effective dose equivalent (CEDE). The CEDE sums the dose to an individual over fifty years to account for the biological retention of radionuclides in the body. The total EDE for one year of exposure to radioactivity is calculated by adding the CEDE to the dose equivalent from external, penetrating radiation received during the year. Unless otherwise specified, all doses discussed here are total EDE values, which include the CEDE for internal emitters.

A collective population dose is expressed in units of person-rem or person-sievert because the individual doses are summed over the entire potentially exposed population. The average individual dose can therefore be estimated by dividing the collective dose by the population.

tion within a 50-mile (80-km) radius are then calculated using conservative DOE- and EPA-approved models to demonstrate compliance with radiation standards. (See the inset on "Radiation Dose" and "Units of Dose Measurement.")

Measurement of Radionuclide Concentrations in Food. The second part of the dose assessment is based on actual radioactivity measurements in samples of foodstuffs grown in the vicinity of the WVDP and the comparison of these values with measurements of samples collected from locations well beyond the potential influence of site effluents.

If any of the near-site food samples contain radionuclide concentrations that are higher than the concentrations in control samples, separate dose calculations are performed to verify that the calculated dose from food is consistent with the dose range estimated by computer modeling. (See "Calculated Dose From Food," later in this chapter.)

These estimates show that the concentrations of radioactivity, whether from sites near or distant from the WVDP, are small – usually near the analytical detection limits – thereby providing additional assurance that operations at the WVDP are not adversely affecting the public. (Biological sampling locations are shown on Figures A-10, A-13, and A-14.)

Dose to the Public

Each year an estimate is made of the potential radiological dose to the public that is attributable to operations and effluents from the WVDP during that calendar year. Estimates are calculated to confirm that no individual could have received a dose that exceeded the limits for protection of the public, as established by the U.S. DOE or the U.S. EPA.

Figure 3-1 shows the estimated maximum individual dose from the WVDP in CY 2007 as compared with the average annual dose a U.S. resident receives from man-made and natural background sources. As presented, estimated dose from the WVDP would have contributed a very small amount (0.067 mrem [0.00067 mSv]) of the total annual man-made radiation dose to the MEOSI. This is much less than the average dose received from consumer products and is insignificant compared with average dose from natural sources.

Estimated dose from the Project to an off-site resident is also far below the federal standard of 100 mrem allowed from any DOE site operation in a calendar year, confirming that efforts at the WVDP to minimize radiological releases are consistent with the ALARA philosophy of radiation protection.

Predicted Dose From Airborne Emissions

Airborne emissions of radionuclides are regulated by the EPA under the Clean Air Act and its implementing regulations. DOE facilities are subject to Title 40 of the Code of Federal Regulations (CFR) 61, Subpart H, National Emission Standards for Hazardous Air Pollutants (NESHAP). Subpart H contains the national emission standards for radionuclides other than radon from DOE facilities. The applicable standard is a maximum of 10 mrem (0.1 mSv) EDE to any member of the public in any year.

Releases of airborne radioactive materials in 2007 from stacks and diffuse sources on the WVDP were modeled using the EPA-approved CAP88-PC computer code (Parks, June 1997). This air dispersion code estimates EDEs for the ingestion, inhalation, air immersion, and ground surface pathways. (See "CAP88-PC Computer Code" in the "Useful Information" Section.)

Site-specific data for CY 2007 (radionuclide releases in curies per year) were used as input to the CAP88-PC code, as were wind data collected from the on-site meteorological tower during 2007 and information from the most recent local population survey. The output from the CAP88-PC code was then used to determine the total EDE from air emissions to the MEOSI and the collective EDE to the population within a 50-mile (80 km) radius of the WVDP. Results are presented in Table 3-2. Although radon is specifically excluded from the NESHAP regulation, an estimate of dose from radon at the WVDP is also included in Table 3-2 for comparison purposes. The estimated radon-220 dose to the population was approximately 0.33 person-rem (0.0033 person-Sv). (For a detailed discussion of radon in air emissions from the WVDP, see the inset on "Radon-220".)

Maximum Dose (Airborne) to an Off-Site Individual. Total curies released to the atmosphere from point sources at the WVDP are summarized in Table 3-3. Based on the nonradon airborne radioactivity released from all site sources during 2007 (i.e., permitted stacks, stacks that do not require permits, and nonpoint sources), it was estimated that a person living in the vicinity of the WVDP could have received a total EDE of 0.0010 mrem (0.000010 mSv) from airborne releases. The computer model estimated that this MEOSI, who was assumed to eat only locally produced foods, was located 1.2 mile (1.9 km) north-northwest of the site.

The dose from aiborne sources is less than 2 minutes of natural background radiation received by an average member of the U.S. population, and is well below the 10-mrem (0.1 mSv) NESHAP limit established by the EPA and mandated by DOE Order 5400.5.

Iodine-129, a long-lived radionuclide, has routinely been found in main stack emissions. During the vitrification of high-level waste, iodine-129 releases increased because gaseous iodine was not as efficiently removed by the vitrification process off-gas treatment system as were most other radionuclides. As more high-level radioactive waste was removed from the tanks and converted into glass, less waste was available to emit iodine-129 and the total emitted decreased. In 2007, iodine-129 concentrations continued to be back to (or below) pre-vitrification levels. Even so, in 2007, iodine-129 continued to account for the largest proportion of dose to an off-site individual from airborne emissions. A comparison of the proportions of dose from various nuclides is presented in Figure 3-2. As shown in this figure, about 95% of the estimated airborne dose from point sources in 2007 was from iodine-129.

Collective Population Dose (Airborne). Based on the latest census data from CY 2000, 1.54 million people were estimated to reside in the U.S. within 50 miles (80 km) of the WVDP. (See Figure A-15.) This popula-

TABLE 3-2
Summary of Annual Effective Dose Equivalents to an Individual and Population From WVDP Releases in 2007

Exposure Pathways	*Annual Effective Dose Equivalent*	
	Maximally Exposed Off-Site Individual [a] *mrem (mSv)*	*Collective Effective Dose Equivalent* [b] *person-rem (person-Sv)*
Airborne Releases [c]	**1.0E-03 (1.0E-05)**	**5.8E-03 (5.8E-05)**
% EPA standard (10 mrem)	0.010%	NA
Waterborne Releases [d]	**6.6E-02 (6.6E-04)**	**3.2E-01 (3.2E-03)**
Effluents only	1.2E-02 (1.2E-04)	1.1E-02 (1.1E-04)
North plateau drainage	5.4E-02 (5.4E-04)	3.1E-01 (3.1E-03)
Total From All Pathways	**6.7E-02 (6.7E-04)**	**3.3E-01 (3.3E-03)**
% DOE standard (100 mrem) - air and water combined	0.067%	NA
% of natural background (295 mrem; 453,000 person-rem) - received from air and water combined	0.023%	0.000072%
Estimated Airborne Radon-220 [e]	**1.1E-02 (1.1E-04)** [f]	**3.3E-01 (3.3E-03)** [f]

Note: Summed values may not exactly match totals due to rounding.
NA - Not applicable. Numerical regulatory standards are not set for the collective EDE to the population.

[a] The maximum exposure to air discharges is estimated to occur at a residence 1.2 mi (1.9 km) north-northwest of the main plant building.

[b] A population of 1.54 million is estimated to reside within 50 mi (80 km) of the site.

[c] Releases are from atmospheric nonradon point and diffuse sources. Calculations use CAP88-PC to estimate individual and population doses. EPA and DOE limits for individual airborne dose are the same.

[d] Estimates are calculated using the methodology described in the WVDP Manual for Radiological Assessment of Environmental Releases at the WVDP (West Valley Nuclear Services Company [WVNSCO], 2003).

[e] Estimated airborne releases are based on indicator measurements and process knowledge. Dose estimates are calculated using CAP88-PC for the main plant process building stack.

[f] The estimated dose from radon-220 is specifically excluded by rule from NESHAP totals.

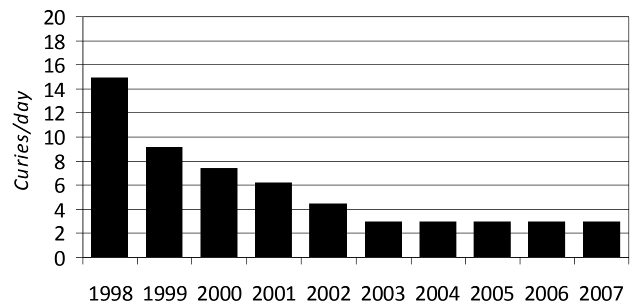
Radon-220

Radon-220, also known as thoron, is a naturally occurring gaseous decay product of thorium-232 present in the airborne emissions from the WVDP main plant. Radon-220 is also associated with the thorium reduction extraction (THOREX) process-related thorium-232 and uranium-232 in the high-level waste.

As reported in Chapter 2 of the 1996 WVDP Site Environmental Report (WVNSCO and Dames & Moore, June 1997), thoron levels were observed to increase during startup of the 1996 high-level waste vitrification process. An estimate of the thoron released during each waste concentration cycle was developed and used to determine a theoretical annual release. During the vitrification phase, an average of about 12 curies per day were assumed to have been released. In 2007, with the vitrification process completed, the average thoron release is estimated to be about three curies per day.

Although large numbers of curies were released relative to other radionuclides, the calculated dose from thoron is quite small because of its short decay half-life and other characteristics. The NESHAP rule specifically excludes thoron from air emission dose calculations, so a dose estimate using CAP88-PC was calculated separately. The theoretical dose to the MEOSI located 1.2 mi (1.9 km) north-northwest of the site in 2007 would have been 0.011 mrem (0.00011 mSv), and the collective dose to the population within an 80-kilometer radius would have been 0.33 person-rem (0.0033 person-Sv). (See Table 3-2.) These theoretical doses are within the same range as historical doses from the man-made radionuclides found in WVDP effluents.

With vitrification completed, thoron releases have decreased to pre-vitrification levels. The figure presented here provides a relative indication of recent trends in the estimated annual thoron releases.



Estimated Radon-220 Releases From the WVDP

tion received an estimated 0.0058 person-rem (0.000058 person-Sv) total EDE from radioactive nonradon airborne emissions released from WVDP point and diffuse sources during 2007. The resulting average EDE per individual was 0.0000038 mrem (0.000000038 mSv).

Predicted Dose From Waterborne Releases

Currently there are no EPA standards establishing limits on the radiation dose to members of the public from liquid effluents, except as applied in 40 CFR Parts 141 and 143, Drinking Water Guidelines (EPA, 1984a; 1984b). Corollary limits for community water supplies are set by the New York State Department of Health (NYSDOH) in the New York State Sanitary Code (Title 10 of the Official Compilation of Codes, Rules, and Regulations of the State of New York [NYCRR] 5-1.52). As indicated in Table 3-1, the only local private residential wells are located upgradient of the WVDP and therefore do not represent a potential source of exposure to radioactivity from Project activities. Cattaraugus Creek is not used as a drinking water supply; therefore, a comparison of estimated doses from this source with the 4-mrem/year (0.04-mSv/year) EPA and NYSDOH drinking water limits is not truly appropriate (although values are well below the drinking water limits). Population dose estimates are based on the presumption that radionuclides are even further diluted in Lake Erie before reaching any municipal water supplies.

Since the Project's liquid effluents eventually reach Cattaraugus Creek, the most important waterborne exposure pathway is the consumption of fish from the creek by local sportsmen and residents. Exposure to external radiation from contamination at the shoreline or in the water is also considered in the model for estimating radiation dose.

The computer codes GENII version 1.485 (Pacific Northwest Laboratory, 1988), which implements the models in NRC Regulatory Guide 1.109 (NRC, 1977), and LADTAP

TABLE 3-3
WVDP Radiological Dose and Release Summary

WVDP Radiological Dose Reporting Table CY 2007							
Dose to the Maximally Exposed Individual		% of DOE 100-mrem Limit	Estimated Population Dose		Population Within 50 Miles (2000 census)	Estimated Natural Radiation Population Dose
0.067 mrem	0.00067 (mSv)	0.067	0.33 person-rem	0.0033 (person-Sv)	1,536,000	453,000 person-rem

WVDP Radiological Atmospheric Emissions[a] CY 2007 In Curies And Becquerels (Bq)										
Tritium	Kr-85	Noble Gases ($T_{1/2}$<40 dy)	Short-Lived Fission and Activation Products ($T_{1/2}$<3 hr)	Fission and Activation Products ($T_{1/2}$>3 hr)	Total Radioiodine	Total Radiostrontium	Total Uranium[b]	Total Plutonium	Total Other Actinides	Other (Rn-220)
2.10E-03 (7.77E+07)	NA	NA	NA	4.76E-06 (1.76E+05)	3.51E-05 (1.30E+06)	2.27E-06 (8.42E+04)	1.12E-07 (4.13E+03)	1.48E-07 (5.47E+03)	2.09E-07 (7.73E+03)	1.10E+03 (4.05E+13)

WVDP Liquid Effluent Releases[c] Of Radionuclide Material - CY 2007 In Curies And Becquerels (Bq)						
Tritium	Fission and Activation Products ($T_{1/2}$>3 hr)	Total Radioiodine	Total Radiostrontium	Total Uranium[d]	Total Plutonium	Total Other Actinides
6.33E-02 (2.34E+09)	<1.02E-02 (<3.76E+08)	<1.04E-04 (<3.84E+06)	3.47E-01 (1.28E+10)	7.12E-04 (2.64E+07)	<2.48E-05 (<9.19E+05)	<2.37E-05 (<8.77E+05)

Note: There are no known significant discharges of radioactive constituents from the site other than those reported in this table.

NA - Not applicable

[a] Air releases are from point sources only.

[b] Total uranium (grams) = 7.56E-02

[c] Water releases are from both controlled liquid effluent releases and from well-characterized site drainages.

[d] Total uranium (grams) = 5.43E+02

FIGURE 3-2
Air Emissions From Point Sources: Dose Percent by Radionuclide in CY 2007

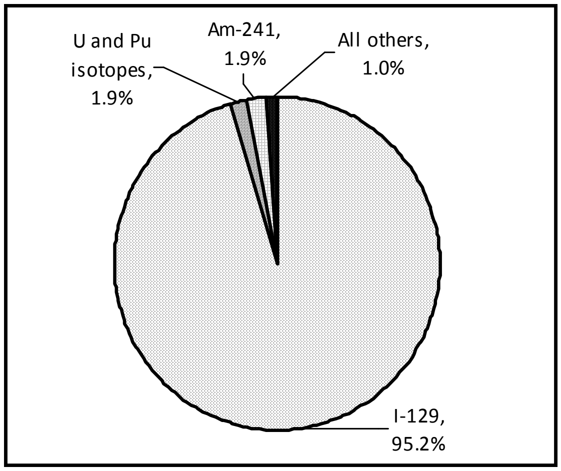


FIGURE 3-3
Water Effluents: Dose Percent by Radionuclide in CY 2007

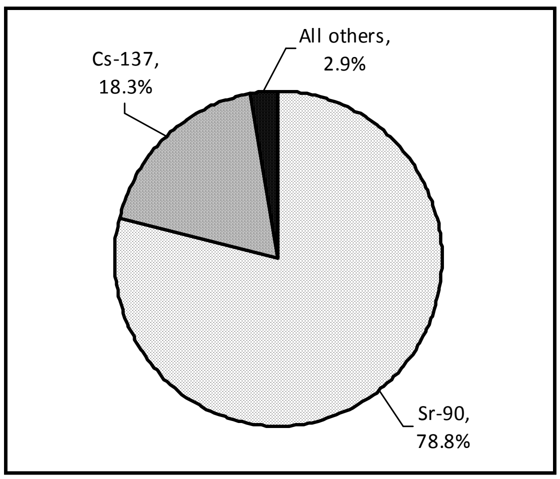
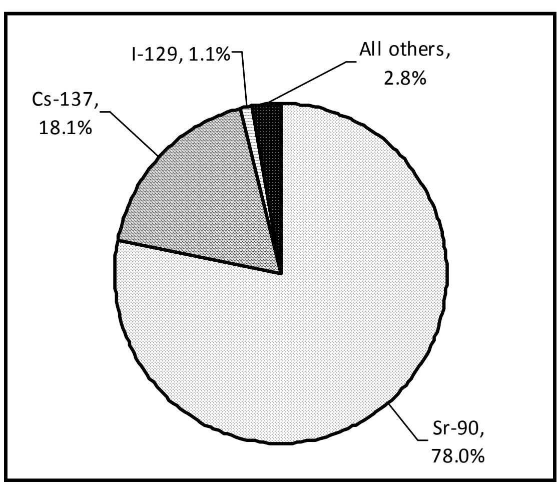


FIGURE 3-4
All Sources: Dose Percent by Radionuclide in CY 2007



II (Simpson and McGill, 1980) were used to calculate site-specific unit dose factors (UDFs) for routine waterborne releases and dispersion of these effluents. The UDFs derived from those codes are tabulated in the "WVDP Manual for Radiological Assessment of Environmental Releases at the WVDP" (WVNSCO, 2003).

Six batches of liquid effluents were released from lagoon 3 (point WNSP001) during 2007. Measurements of the radioactivity discharged in these effluents were combined with the UDFs to calculate the EDE to the MEOSI and the collective EDE to the population living within a 50-mile (80-km) radius of the WVDP.

In addition to measurements from WNSP001, radioactivity measurements from sewage treatment facility effluents (WNSP007) were included in the EDE calculations. The french drain at WNSP008, a third release point that is listed in the SPDES permit for the WVDP, has been sealed off since 2001 and was therefore not considered a source of discharge in 2007.

Besides the two controlled release points at WNSP001 and WNSP007, water from two natural drainage channels on the north plateau originating on the Project premises contain measurable concentrations of radioactivity: the northeast swamp (WNSWAMP) and north swamp (WNSW74A). Although releases from WNSWAMP and WNSW74A are not considered "controlled" releases, they are well characterized and have been routinely sampled and monitored.

There were no unplanned releases of waterborne radioactivity to the off-site environment in 2007.

Results from monitoring points are included in the EDE calculations for the MEOSI and the collective population. See Figure 3-3 for a comparison of estimated doses attributable to specific waterborne radionuclides. As presented, strontium-90 and cesium-137 account for almost all of the estimated waterborne dose, at 78.8% and 18.3%, respectively.

Maximum Dose (Waterborne) to an Off-Site Individual. Based on the radioactivity in liquid effluents discharged from the WVDP (lagoon 3 and the sewage treatment plant) during 2007, an off-site individual could have received a maximum EDE of 0.012 mrem (0.00012 mSv). (See Table 3-2.) About 91% of this dose was from cesium-137. The maximum off-site individual EDE due to drainage from the north plateau was 0.054 mrem (0.00054 mSv). About 96% of the north plateau dose was attributable to strontium-90.

The combined EDE to the maximally exposed individual from liquid effluents and drainage was 0.066 mrem (0.00066 mSv). This annual dose is very small in comparison to the 295-mrem (2.95 mSv) dose that is received by an average member of the U.S. population from natural background radiation.

Collective Population Dose (Waterborne). As a result of radioactivity released in liquid effluents from the WVDP during 2007, the population living within 50 mile (80 km) of the site received an estimated collective EDE of 0.011 person-rem (0.00011 person-Sv). The collective dose to the population from the effluents plus the north plateau drainage was 0.32 person-rem (0.0032 person-Sv). The resulting average EDE per individual is 0.00021 mrem (0.0000021 mSv). This dose is an inconsequential addition to the dose that an average person receives in one year from natural background radiation.

Predicted Dose From All Pathways

The potential dose to the public from both airborne and liquid effluents released from the Project in 2007 is the sum of the individual dose contributions. (See Table 3-2 and Figure 3-4.) The calculated maximum EDE from all pathways to a nearby resident was 0.067 mrem (0.00067 mSv). This dose is 0.067% of the 100-mrem (1-mSv) annual limit in DOE Order 5400.5. As in past years, CY 2007 results continued to demonstrate WVDP compliance with applicable radiation standards for protection of the public and the environment. As presented in Figure 3-4, the largest proportion of estimated EDE to an off-site individual in 2007 was from strontium-90 via the waterborne pathway.

In CY 2007, the total collective EDE to the population within 50 mile (80 km) of the site was 0.33 person-rem (0.0033 person-Sv), with an average EDE of 0.00021 mrem (0.0000021 mSv) per individual.

Figure 3-5 shows the calculated annual dose to the hypothetical maximally exposed individual over the last 10 years. The estimated doses for 2007 were slightly higher than those in 2006. As shown by this figure, the increase is due to waterborne contributions, and is attributed to the increase in strontium-90 activity coming from the drainage point location WNSWAMP on the north plateau.

Figure 3-6 shows the collective dose to the population over the last 10 years. The radioactivity in the human pathway represented by these data confirms the continued inconsequential addition to the natural background radiation dose that individuals and

FIGURE 3-5
Effective Dose Equivalent From Liquid and Airborne Effluents to a Maximally Exposed Individual Residing Near the WVDP

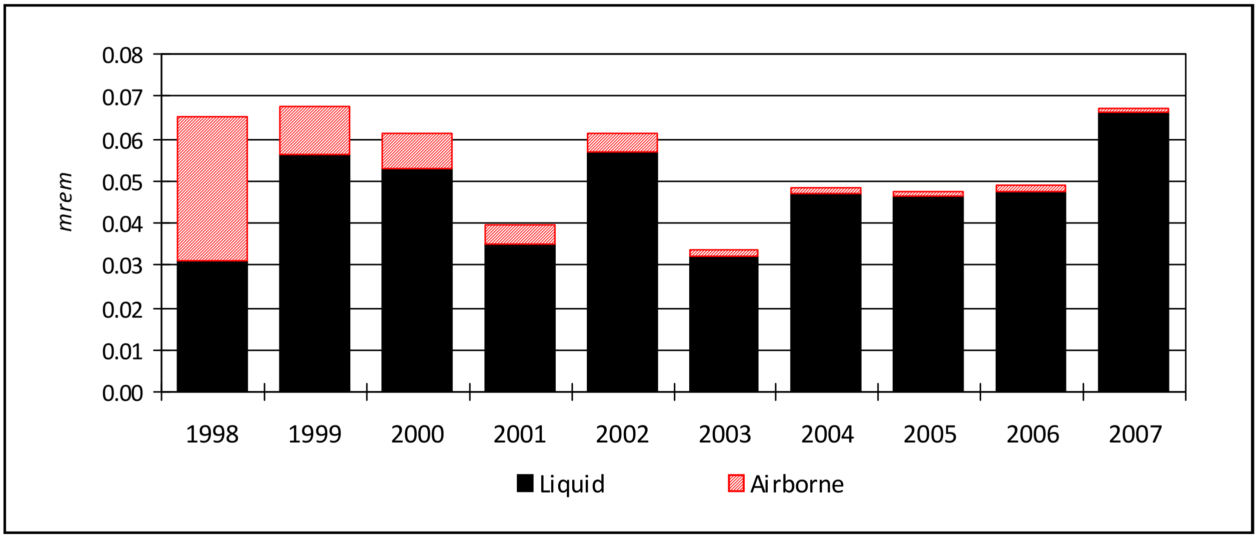
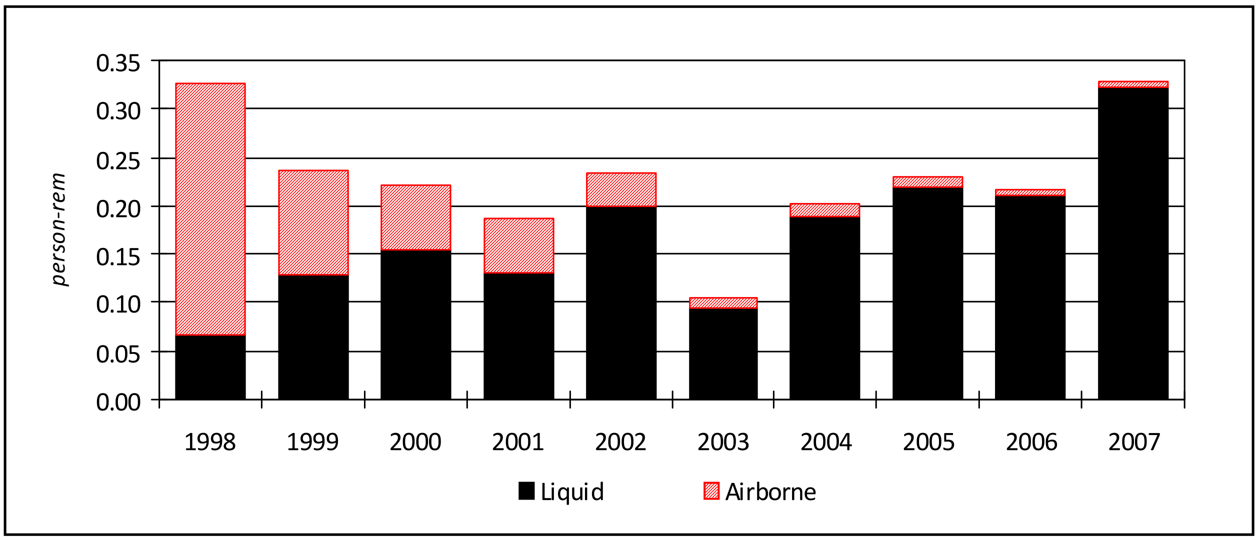


FIGURE 3-6
Collective Effective Dose Equivalent From Liquid and Airborne Effluents to the Population Residing Within 50 Miles (80 km) of the WVDP



the population around the WVDP receive from Project activities.

Calculated Dose From Food. Most radionuclide concentrations in near-site food samples were statistically indistinguishable from concentrations in background samples. Conservative estimates of dose due to consuming near-site fish, deer, milk, beans, corn, and apples were about 0.84 mrem/year (0.0084 mSv/year). This estimate assumes an individual consumes the maximum quantities of each food item. The predominant potential dose from food was estimated to be from consumption of venison. These independent estimates confirmed the low modeled dose estimates based on air and water effluents, as summarized in Table 3-2.

Risk Assessment

Estimates of cancer risk from ionizing radiation have been presented by the National Council on Radiation Protection and Measurements (NCRP) (1987) and the National Research Council's Committee on Biological Effects of Ionizing Radiation (1990).

The NCRP estimates that the probability of fatal cancer occurring is between one and five per 10,000 people who are each exposed to one rem (i.e., a risk coefficient of between 0.0001 and 0.0005). DOE guidance has, in the past, recommended using a risk coefficient of 0.0005 (ICRP, 1991) to estimate risk to a MEOSI. Recent DOE guidance recommends using the even more conservative risk coefficient of 0.0006 provided by the Interagency Steering Committee on Radiation Standards (January 2003). The estimated risk to the hypothetical individual residing near the WVDP from airborne and waterborne releases in 2007 was about 4 per 100 million (a risk of 0.00000004). This risk is well below the range of 0.000001 to 0.00001 per year considered by the ICRP to be a reasonable risk for any member of the public (ICRP Report Number 26, 1977).

Release of Materials Containing Residual Radioactivity

The DOE ensures protection of the public and the environment through the implementation of the standards and requirements set forth in DOE O 5400.5. In addition to discharges to the environment, the release of property containing residual radioactive materials is considered a potential contributor to the dose received by the public.

In 2000, the Secretary of Energy placed a moratorium on the release of volumetrically contaminated metals, and suspended the unrestricted release of metals from radiological areas of DOE facilities for recycling. The moratorium and suspension currently remain in effect.

A graded approach is utilized by the WVDP for the release of equipment and materials to the public for unrestricted use. This approach considers the use of the material, the potential for internal contamination, the location the material was used, and process knowledge of the item(s) to be released. In accordance with WVDP radiological controls manuals and procedures, these criteria are assessed and documented, and the material(s) may be radiologically surveyed to verify the survey results are within the contamination limits presented in DOE O 5400.5, Figure IV-1. Records of released property are maintained.

Presently there are no approved criteria for releasing WVDP material to the public that may have been contaminated in depth or volume; therefore, no unrestricted release of scrap metal or other material of this type has occurred. Compliance with the Secretary of Energy’s suspension of unrestricted release of scrap metal for recycle continues at the WVDP.

The Secretary does encourage efforts to promote reuse and recycling of excess property for use within the DOE complex. These transfers occur only when property is transferred to individuals authorized to use such material.

Dose to Biota

Radionuclides from both natural and man-made sources may be found in environmental media such as water, sediments, and soils. In the past, it has been assumed that if radiological controls are sufficient to protect humans, other living things are also likely to be sufficiently protected. This assumption is no longer considered adequate, since populations of plants and animals residing in or near these media or taking food or water from these media may be exposed to a greater extent than are humans. For this reason, the DOE prepared a technical standard that provides methods and guidance to be used to evaluate doses of ionizing radiation to populations of aquatic animals, riparian animals (i.e., those that live along banks of streams or rivers), terrestrial plants, and terrestrial animals.

Methods in this technical standard, "A Graded Approach for Evaluating Radiation Doses to Aquatic and Terrestrial Biota" (DOE-STD-1153-2002, July 2002), were used in 2007 to evaluate radiation doses to aquatic and terrestrial biota within the confines of the WNYNSC, which includes the WVDP. Doses were assessed for compliance with the limit in DOE Order 5400.5 for native aquatic animal organisms (1 rad/day) and for compliance with the thresholds for terrestrial plants (also 1 rad/day) and for terrestrial animals (0.1 rad/day), as proposed in DOE-STD-1153-2002. Note that the absorbed dose unit (rad) is used for biota instead of the units used for indicating human risk (rem).

The RESRAD-BIOTA Code (January 2004), a calculation tool provided by the DOE for implementing the technical standard, was used to compare existing radionuclide concentration data from environmental sampling with biota concentration guide (BCG) screening values and to estimate upper bounding doses to biota. Data were collected from surface water samples obtained in 2007 and sediments over the last five years (2003–2007). Soil data from the most recent ten years (1995–2004) for which special on-site soil sampling was conducted and the most recent ten years of routine on-site soil sampling (1998–2007) were used. Differing time periods were used because radionuclide concentrations change more rapidly over time in surface waters than in sediments and soils, as reflected in their sampling frequencies (monthly or quarterly for water, annually or every third year for sediments and soils).

Concentration data for radionuclides in each medium were entered into the RESRAD-BIOTA Code. The value for each radionuclide was automatically divided by its corresponding BCG to calculate a partial fraction for each nuclide in each medium. Partial fractions for each medium were added to produce a sum of fractions.

Exposures from the aquatic pathway may be assumed to be less than the aquatic dose limit from DOE Order 5400.5 if the sum of fractions for the water medium plus that for the sediment medium is less than 1.0. Similarly, exposures from the terrestrial pathway may be assumed to be less than the proposed dose limits for both terrestrial plants and animals if the sum of fractions for the water medium plus that for the soil medium is less than 1.0.

It was found that the isotopes with the highest sums of fractions – the radionuclides that contributed the largest component of both aquatic and terrestrial dose to biota – were strontium-90 and cesium-137. Per guidance in DOE-STD-1153-2002, the populations of organisms most sensitive to strontium-90 and cesium-137 in this evaluation – that is, those most likely to be adversely affected via the aquatic and terrestrial pathways – were determined to be populations of riparian animals (such as the raccoon [aquatic dose]) and terrestrial animals (such as the deer mouse [terrestrial dose]). Populations of both animals are found on the WNYNSC.

In accordance with the graded approach described in DOE-STD-1153-2002, a general screening was first conducted using the maximum radionuclide concentrations from surface waters, sediments, and soils. Maximum radionuclide concentrations exceeded applicable BCG limits for both aquatic and terrestrial evaluations.

As recommended in DOE-STD-1153-2002, a site-specific screening was then done using estimates of average radionuclide concentrations derived from measurements in surface waters, sediments, and soils. Results are summarized in Table 3-4.

At the site-specific screening level, the sums of fractions for the aquatic and terrestrial evaluations were 0.32 and 0.27, respectively. The sum of fractions for each assessment was less than 1.0, indicating that applicable BCGs were met for both the aquatic and terrestrial evaluations.

Upper bounding doses associated with the aquatic system evaluation were 0.0061 rad/day to an aquatic animal and 0.032 rad/day to a riparian animal, far below the 1 rad/day standard from DOE Order 5400.5 for dose to a native aquatic animal. Upper bounding doses associated with the terrestrial system evaluation were 0.027 and 0.0025 rad/day to terrestrial animals and plants, again well below the guidance thresholds (0.1 and 1 rad/day, respectively).

It was therefore concluded that populations of aquatic and terrestrial biota (both plants and animals) on the WNYNSC are not being exposed to doses in excess of the existing DOE dose standard for native aquatic animals (U.S. DOE, February 1990) and the international standards for terrestrial organisms (International Atomic Energy Agency [IAEA], 1992).

TABLE 3-4
2007 Evaluation of Dose to Aquatic and Terrestrial Biota

AQUATIC SYSTEM EVALUATION							
Nuclide	*Water BCG [a] (pCi/L)*	*Mean Water Value (pCi/L)*	*Ratio*	*Sediment BCG [a] (pCi/g)*	*Mean Sediment Value (pCi/g)*	*Ratio*	*Water and Sediment Sum of Fractions*
Cesium-137	42.7	2.79	6.54E-02	3,130	5.74	1.84E-03	0.067
Strontium-90	279	69.6	2.50E-01	583	1.22	2.09E-03	0.25
All Others	NA	NA	6.00E-04	NA	NA	5.10E-04	0.0011
Sum of Fractions			3.16E-01			4.44E-03	**0.32**
Estimated upper bounding dose to an aquatic animal = 0.0061 rad/day; to a riparian animal = 0.032 rad/day.							

TERRESTRIAL SYSTEM EVALUATION							
Nuclide	*Water BCG [a] (pCi/L)*	*Mean Water Value (pCi/L)*	*Ratio*	*Soil BCG [a] (pCi/g)*	*Mean Soil Value (pCi/g)*	*Ratio*	*Water and Soil Sum of Fractions*
Cesium-137	599,000	2.79	4.66E-06	20.8	4.64	2.23E-01	0.22
Strontium-90	54,500	69.6	1.28E-03	22.5	1.01	4.49E-02	0.046
All Others	NA	NA	<1.00E-06	NA	NA	1.10E-03	0.0011
Sum of Fractions			1.28E-03			2.69E-01	**0.27**
Estimated upper bounding dose to a terrestrial plant = 0.0025 rad/day; to a terrestrial animal = 0.027 rad/day.							

NA - Not applicable

[a] The biota concentration guides (BCGs) are calculated values. Except for the sums of fractions and dose estimates, which are rounded to two significant digits, all values are expressed to three significant digits.

Summary

Tables 3-2, 3-3, and 3-4 summarize radiological dose and release information for CY 2007.

Predictive computer modeling of airborne and waterborne releases resulted in estimated hypothetical doses to the maximally exposed individual that were orders of magnitude below all applicable EPA standards and DOE Orders, which place limitations on the release of radioactive materials and dose to individual members of the public. The collective population dose was also assessed and found to be orders of magnitude below the natural background radiation dose. Additionally, estimates indicated that populations of biota at the WVDP are exposed at a fraction of the DOE and IAEA guidelines for dose to biota.

Based on the overall dose assessment, the WVDP was found to be in compliance with applicable effluent radiological guidelines and standards during calendar year 2007.

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GROUNDWATER PROTECTION PROGRAM

Groundwater Monitoring Program Overview

Groundwater monitoring at the West Valley Demonstration Project (WVDP or Project) complies with all applicable state and federal regulations and meets the requirements of United States (U.S.) Department of Energy (DOE) Order 450.1. Groundwater monitoring data are used by site managers to determine baseline groundwater conditions, facilitate early detection of existing and potential groundwater contamination sources, provide surveillance of these sources, and provide information for decision-making.

The WVDP's groundwater monitoring program is outlined in the "Groundwater Monitoring Plan" (GMP), which discusses groundwater characterization, the current groundwater sampling agenda, and compliance with long-term monitoring requirements under DOE Orders and the Resource Conservation and Recovery Act (RCRA) §3008(h) Administrative Order on Consent (Consent Order). The "WVDP Groundwater Protection Management Program Plan" documents the Project's approach to the protection of groundwater from on-site activities.

Site groundwater is not used for drinking or operational purposes, nor is effluent discharged directly to groundwater. The majority of the site groundwater eventually flows to Cattaraugus Creek and then to Lake Erie. Surveys have determined that no public water supplies are drawn from Cattaraugus Creek, downstream of the WVDP. Upgradient of the site, groundwater is used as a public and private drinking water supply by local residents.

Surface Water Hydrology

The 167-acre (68-hectare [ha]) Project is located within the Western New York Nuclear Service Center (WNYNSC), which comprises approximately 3,338 acres (1,351 ha) and is located at the northern border of Cattaraugus County. The WNYNSC lies within the watershed of Cattaraugus Creek, which flows northwestward to Lake Erie. Buttermilk Creek, a tributary of Cattaraugus Creek, drains the WNYNSC.

The WVDP is drained by Quarry Creek, Erdman Brook, and Franks Creek, which flow into Buttermilk Creek. (See Figs. A-1 and A-5 in Appendix A.) Erdman Brook bisects the WVDP into the north and south plateaus. The main plant, waste tanks, and lagoons are located on the north plateau. The drum cell, the U.S. Nuclear Regulatory Commission (NRC)-Licensed Disposal Area (NDA), and the New York State-Licensed Disposal Area (SDA) are located on the south plateau.

Geology

The WNYNSC is situated upon a layered sequence of glacial-age sediments that fill a steep-sided bedrock valley that is composed of interbedded shales and siltstones (Rickard, 1975).

The glacial sediments overlying the bedrock consist of a sequence of three glacial tills of Lavery, Kent, and possibly Olean age. The tills are separated by stratified fluvio-lacustrine deposits (silty or silty/sandy lakebed sediments). On the Project's north plateau, the Lavery till is capped by coarse-grained alluvial-fluvial deposits (sandy/silty/gravelly streambed sediments). See Table 4-1 for the descriptions and the geographic distribution of these units.

Hydrogeology

The sediments above the Kent till – the Kent recessional sequence, the weathered and unweathered Lavery till, the intra-Lavery till-sand, and the alluvial sand and gravel – are generally regarded as containing all of the potential routes for contaminant migration from the Project via groundwater. (See Fig. 4-1.) The Kent till has a relatively low permeability and does not provide a pathway for contaminant movement from the WVDP; therefore, it is not discussed here.

Hydrologic conditions of the site are more fully described in "Environmental Information Document, Volume III: Hydrology, Part 4" (West Valley Nuclear Services Co. [WVNSCO], March 1996) and in the "RCRA Facility Investigation Report (RFI) Vol. 1: Introduction and General Site Overview" (WVNSCO and Dames & Moore, July 1997).

TABLE 4-1
Summary of Hydrogeology at the WVDP

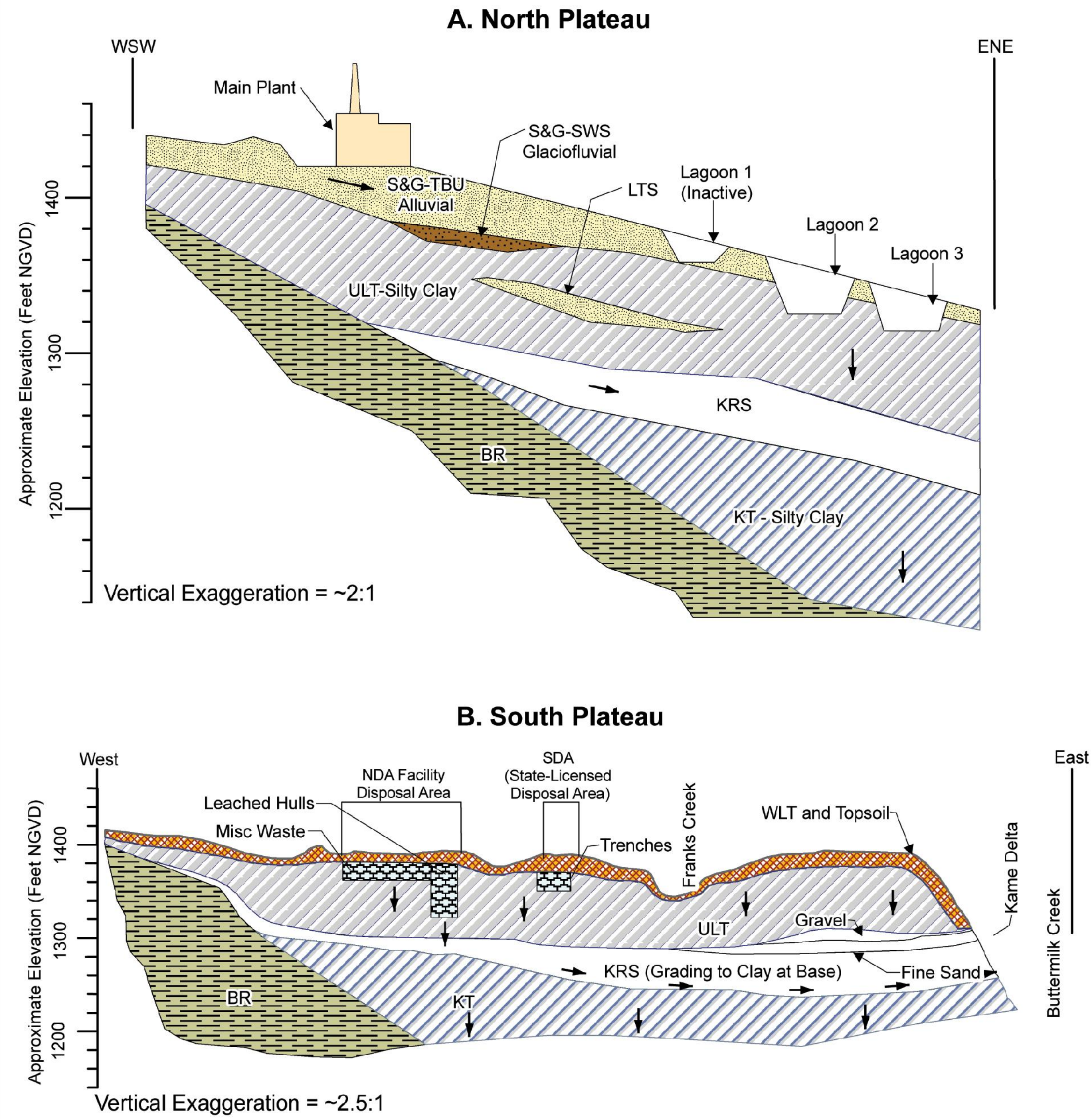
Geologic Unit	Description	Groundwater Flow Characteristics	Hydraulic Conductivity [a]	Location
Sand and Gravel; Thick-Bedded Unit	Silty sand and gravel layer composed of younger Holocene alluvial deposits	Flow is generally northeast across the plateau toward Franks Creek, with groundwater near the northwestern and southeastern margins flowing radially outward toward Quarry Creek and Erdman Brook	9.2 ft/day (3.2E-03 cm/sec) or 110 in/day	North plateau
Sand and Gravel; Slackwater Sequence	Interbedded silty sand and gravel layers composed of Pleistocene-age glaciofluvial deposits separated from the sand and gravel thick-bedded unit by a discontinuous clay interval	Flow is to the northeast along gravel layers toward Franks Creek	21.0 ft/day (7E-03 cm/sec) or 2502 in/day	Underlies a portion of the north plateau
Weathered Lavery Till	Upper zone of the Lavery till which has been exposed at the ground surface; weathered and fractured to a depth of 3–16 ft (0.9–4.9 m); brown in color due to oxidation; contains numerous desiccation cracks and root tubes	Flow has both horizontal and vertical components allowing groundwater to move laterally across the south plateau before moving downward into the unweathered lavery till or discharging to nearby incised stream channels	5E-02 ft/day (2E-05 cm/sec) or 0.6 in/day; the highest conductivities are associated with dense fracture zones found within the upper 7 ft (2 m) of the unit	South plateau
Unweathered Lavery Till	Olive gray silty clay with intermittent lenses of silt and sand; ranges up to 130 ft (40 meters) in thickness	Flow is vertically downward at a relatively slow rate; unit is considered an aquatard	2E-03 ft/day (6.4E-07 cm/sec) or 0.02 in/day	Underlies both the north and south plateaus
Lavery Till Sand	Thin, sandy unit of limited areal extent and variable thickness within the Lavery till.	Flow is to the east-southeast toward Erdman Brook	0.26 ft/day (9E-05 cm/sec) or 3 inches/day	Primarily beneath the southeastern portion of the north plateau
Kent Recessional Sequence	Interbedded clay and silty clay layers locally overlain by coarser-grained sands and gravels; pinches out near the east side of Rock Springs Road	Flow is to the northeast; recharge from the overlying till and from bedrock to the southwest; discharges into Buttermilk Creek	1.3E-02 ft/day (4.5-06 cm/sec) or 0.15 in/day	Underlies most of the Project, except areas adjacent to Rock Springs Road

[a] Hydraulic conductivities represent an average of testing results from 1991 through 2007.

FIGURE 4-1

Geologic Cross Sections of the North and South Plateaus at the WVDP

J:/GIS/ArcMap/ASER/ASER_2007/ASER_2007_Fig4-1.mxd,r.0 3/04/2008 JRL



Legend

S&G-TBU	Sand and Gravel - Thick Bedded Unit	KRS	Kent Recessional Sequence
S&G-SWS	Sand and Gravel - Slack Water Sequence	KT	Kent Till
LTS	Lavery Till Sand	BR	Shale Bedrock
WLT	Weathered Lavery Till	⟶	Conceptual Groundwater Flow Direction
ULT	Unweathered Lavery Till		

(NGVD - National Geodetic Vertical Datum)

Routine Groundwater Monitoring Program (GMP)

Groundwater Monitoring Program Highlights 1982 Through 2007. Program content is dictated by regulatory requirements in conjunction with current operating practices and historical knowledge of previous site activities.

- Groundwater monitoring at the WVDP began in 1982 and continued to expand through 1992 with the addition of new wells, groundwater seep locations, a french drain outfall, and the NDA interceptor trench sump.

- In 1993, monitoring results indicated elevated gross beta activity in groundwater from the sand and gravel unit on the north plateau. Subsequent investigation of this area delineated a plume of contamination with a southwest to northeast orientation. (See "Groundwater Sampling Observations on the North Plateau" and Figure 4-2 in this chapter for more detail.)

- An RFI expanded characterization program was conducted during 1993 and 1994 to fully assess potential releases of hazardous wastes or constituents from on-site solid waste management units (SWMUs). This investigation, which consisted of two rounds of sampling for a wide range of radiological and chemical parameters, provided valuable information regarding groundwater conditions near each SWMU. Evaluation of these results influenced monitoring program modifications.

- Long-term monitoring needs were the focus of a 1995 groundwater monitoring program evaluation. After a comprehensive assessment, the number of sampling locations was reduced from 91 to 65 and analytical parameters were tailored to each sampling location for a more focused, efficient, and cost-effective program.

- In 1996, several groundwater seep monitoring locations on the northeast edge of the north plateau were added to the monitoring program and the french drain outfall was deleted for groundwater purposes. Five seep locations continue to be monitored.

- Four new groundwater monitoring wells were installed during August 2003 to provide upgradient and downgradient monitoring coverage for the remote-handled waste facility.

- Reductions in analytes or sampling frequencies were implemented at 14 monitoring locations in early 2005.

- The GMP was reviewed in 2007 and recommendations were made to reduce some analytes and sampling frequency at 20 monitoring wells and to discontinue sampling at four wells. These changes were implemented in 2008.

Groundwater is routinely monitored in the six hydrogeologic units described in Table 4-1. (The two sub-units of the sand and gravel are frequently monitored as one unit since many sand and gravel well screens are placed across both units.) In 2007, a total of 69 on-site and one off-site groundwater monitoring locations were sampled. The on-site locations included 63 monitoring wells and well points, five groundwater seepage points, and one sump/manhole. The frequency of monitoring and the constituents measured are a function of regulatory requirements, as well as current operating practices and historical knowledge of previous site activities.

Monitoring Well Network. The WVDP groundwater monitoring network is a vital component of the Environment Protection Program implemented under DOE Order 450.1. Many of the wells were installed to monitor one or more SWMUs on the WVDP in accordance with the Consent Order. Table 4-2 lists the wells in the network, the super solid waste management units (SSWMUs), the geologic units, and the analytes measured in 2007. Table 4-3 defines the analyte groups. (See "RCRA §3008(h) Administrative Order on Consent" in the "Environmental Compliance Summary.") Tables 4-4 and 4-5 provide an overview of groundwater monitoring during 2007 organized by geographic area and by monitoring purpose.

Groundwater Elevation Monitoring. Potentiometric (water level) data are measured at the monitoring network wells in conjunction with the quarterly analytical sampling schedule. (See Figs. A-8 and A-9 in Appendix A.) Groundwater elevation data are used to produce potentiometric surface maps that delineate groundwater flow directions and gradients. Long-term trend graphs are used to illustrate variations in groundwater elevations over time, such as seasonal fluctuations.

Surface water elevations are also measured on the north plateau where the water table in the sand and gravel unit intersects the ground surface, resulting in standing water. These measurements supplement

TABLE 4-2
WVDP Groundwater Monitoring Network Sorted by Geologic Unit

Well ID	*SSWMU*	*Gradient Position*	*Analytical Parameters in 2007*		*Well ID*	*SSWMU*	*Gradient Position*	*Analytical Parameters in 2007*
Sand and Gravel Wells								
103[a]	1, 3	D	I, RI, V		801[a]	8, 6	U, D	I, RI, S, V
104	1	C	I, RI		802	8	D	I, RI, V
105	1	C	I, RI		803[a]	8	D	I, RI, SV, V
106	1	D	I, RI		804[a]	8	D	I, RI, V
111[a]	1	D	I, RI, M, S, SV, V		1302	NA[b]	D	I, RI, M, R, SV, V
116[a]	1, 8	C, U	I, RI, S, V		1304	NA[b]	U	I, RI, M, R, SV, V
201	2	U	I, RI		8603	8	U	I, RI, S
205	2, 3	D	I, RI		8604	1	C	I, RI
301[a]	3	B	I, RI		8605[a]	1, 2	D	I, RI, M, S, SV, V
302	3	U	I, RI		8607[a]	6, 4	U, D	I, RI, V
401[a]	4, 3	B	I, RI, R		8609[a]	3, 4, 6	D, D, U	I, RI, S, V
402	4	B	I, RI		8612[a]	8	D	I, RI, SV, V
403	4	U	I, RI		NB-1S	NA	B	I, RI
406[a]	4, 6	D, U	I, RI, R, V		WP-A	NA[c]	NA	I, RI
408[a]	4, 3	D	I, RI, R, V		WP-C	NA[c]	NA	I, RI
501[a]	5	U	I, RI, S, V		WP-H	NA[c]	NA	I, RI
502[a]	5	D	I, RI, S, SM, V		SP04	NA[d]	D	RI
602A	6	D	I, RI		SP06	NA[d]	D	RI
604	6	D	I, RI		SP11	NA[d]	D	I, RI
605	6	D	I, RI		SP12[a]	NA[d]	D	I, RI, V
706[a]	7	B	I, RI, M, R, SV, V		GSEEP[a]	NA[d]	D	I, RI, V
Lavery Till Sand Wells								
204[a]	2, 3	D	I, RI		208	2	D	I, RI
206	2	C	I, RI					
Weathered Lavery Till Wells								
906[a]	9	D	I, RI		1005[a]	9, 10	C, U	I, RI
908[a]	9	B	I, RI		1006[a]	9, 10	C, D	I, RI
909[a]	9	D	I, RI, M, R, SV, V		1007	10	D	I, RI
NDATR[a]	9	D	I, RI, M, R, SV, V		1008C[a]	9, 10	U	I, RI
Unweathered Lavery Till Wells								
107	1	D	I, RI, V		704	7	D	I, RI, V
108	1	D	I, RI, V		707	7	C	I, RI
110[a]	1	D	I, RI, V		910[a]	9	D	I, RI
405	4	B	I, RI, M, R, SV, V		1301	NA[b]	D	I, RI, M, R, SV, V
409	4	D	I, RI		1303	NA[b]	U	I, RI, M, R, SV, V
Kent Recessional Sequence Wells								
901[a]	4	B	I, RI		1008B	10	U	I, RI
902[a]	9	U	I, RI		8610[a]	9	D	I, RI
903[a]	9	D	I, RI		8611[a]	9	D	I, RI

Gradient Positions: B (background); C (crossgradient); D (downgradient); U (upgradient)
Analytical Parameters: I (Contamination Indicator Parameters); RI (Radiological Indicator Parameters); V (Volatile Organic Compounds); SV (Semivolatile Organic Compounds); M (Groundwater Metals); SM (Special Monitoring Parameters for early warning wells); R (Radioisotopic Analyses: alpha-, beta-, and gamma-emitters); and S (Strontium-90)

[a] Monitoring for certain parameters is required by the RCRA §3008(h) Consent Order.
[b] Monitor upgradient and downgradient of the remote-handled waste facility.
[c] Monitor north and east of the main plant.
[d] Monitor groundwater emanating from seeps along the edge of the north plateau.

TABLE 4-3
WVDP Groundwater Sampling and Analysis Agenda

Analyte Group	*Description of Parameters*
Contamination Indicator Parameters (I)	pH, specific conductance (field measurements)
Radiological Indicator Parameters (RI)	Gross alpha, gross beta, tritium
Volatile Organic Compounds (V)	6 NYCRR Part 373-2 Appendix 33 Volatile Organic Compounds (VOCs)
Semivolatile Organic Compounds (SV)	6 NYCRR Part 373-2 Appendix 33 Semivolatile Organic Compounds (SVOCs) and tributyl phosphate (TBP)
Groundwater metals (M)	6 NYCRR Part 373-2 Appendix 33 Metals
Special Monitoring Parameters for early warning wells (SM)	Aluminum, iron, manganese
Radioisotopic Analyses: alpha-, beta-, and gamma-emitter (R)	Carbon-14,strontium-90, technetium-99, iodine-129, cesium-137, radium-226, radium-228, uranium-232, uranium-233/234, uranium-235/236, uranium-238, total uranium.
Strontium-90 (S)	Strontium-90

TABLE 4-4
WVDP 2007 Groundwater Monitoring Overview by Geographic Area

Number of...	*Total WVDP*	*North Plateau*	*South Plateau*	*Off-Site Residential*
Monitoring Points Sampled - Analytical[a]	70	54	15	1
Monitoring Points - Water Elevations Only	48	32	16	0
Monitoring Events	5	4	4	1
Analyses	1,254	1,064	184	6
Results	10,314	8,929	1,372	13
Percent of Nondetectable Results	86%	86%	86%	62%
Water Elevation Measurements	437	312	125	0

[a] Total number includes 69 on-site monitoring points and one off-site monitoring point.

TABLE 4-5
WVDP 2007 Groundwater Monitoring Overview by Purpose

Number of...	*Regulatory/ Waste Management*	*Environmental Surveillance*
Monitoring Points Sampled - Analytical[a]	34	36
Monitoring Points - Water Elevations Only	0	48
Monitoring Events	4	5
Analyses	681	573
Results	5,867	4,447
Percent of Nondetectable Results	86%	86%
Water Elevation Measurements	128	309

[a] Total number includes 69 on-site monitoring points and one off-site monitoring point.

TABLE 4-6
Maximum Concentrations of Radiological Parameters in WVDP Wells During 2007

Radionuclide	Regulatory/Waste Management		Environmental Surveillance	
	Well ID	Maximun Concentration (µCi/mL)	Well ID	Maximun Concentration (µCi/mL)
Gross Beta	Well 408	3.85E-04	Well 104	1.10E-04
Strontium-90	Well 408	1.51E-04	Well 8603	4.09E-05
Tritium	WNNDATR	3.46E-06	WP-C	3.08E-05

groundwater elevations measured at nearby monitoring wells to provide data in areas where monitoring well coverage is sparse or nonexistent.

Analytical Trigger Level Evaluation. A computerized data-screening program uses “trigger levels” – preset conservative values for chemical and radiological concentrations and groundwater elevation measurements – to promptly identify anomalies in monitoring results that may require further investigation. The trigger levels are based on regulatory limits, detection limits, or statistically derived values.

Groundwater Sampling Observations on the North Plateau

The routine GMP network in the sand and gravel unit on the north plateau includes 32 monitoring wells, three well points, and five groundwater seepage locations. A discussion of the significant groundwater quality observations on the north plateau follows.

Gross Beta and the Strontium-90 Plume. In the early 1990s, elevated gross beta activity was detected in groundwater of the sand and gravel unit northeast of the building where Nuclear Fuel Services, Inc. reprocessed nuclear fuel (the “Main Plant” on Fig. 4-2). In 1993, elevated gross beta concentrations were detected in surface water near the northeastern edge of the north plateau. Extensive subsurface investigations characterized the plume, which extends from beneath the main plant process building (MPPB) to the northeast quadrant of the north plateau. Strontium-90 and its daughter product, yttrium-90, were identified as the major isotopic components of the gross beta activity (WVNSCO, 1995). The presumed source of the strontium-90 activity can be traced to soils beneath the southwest corner of the MPPB.

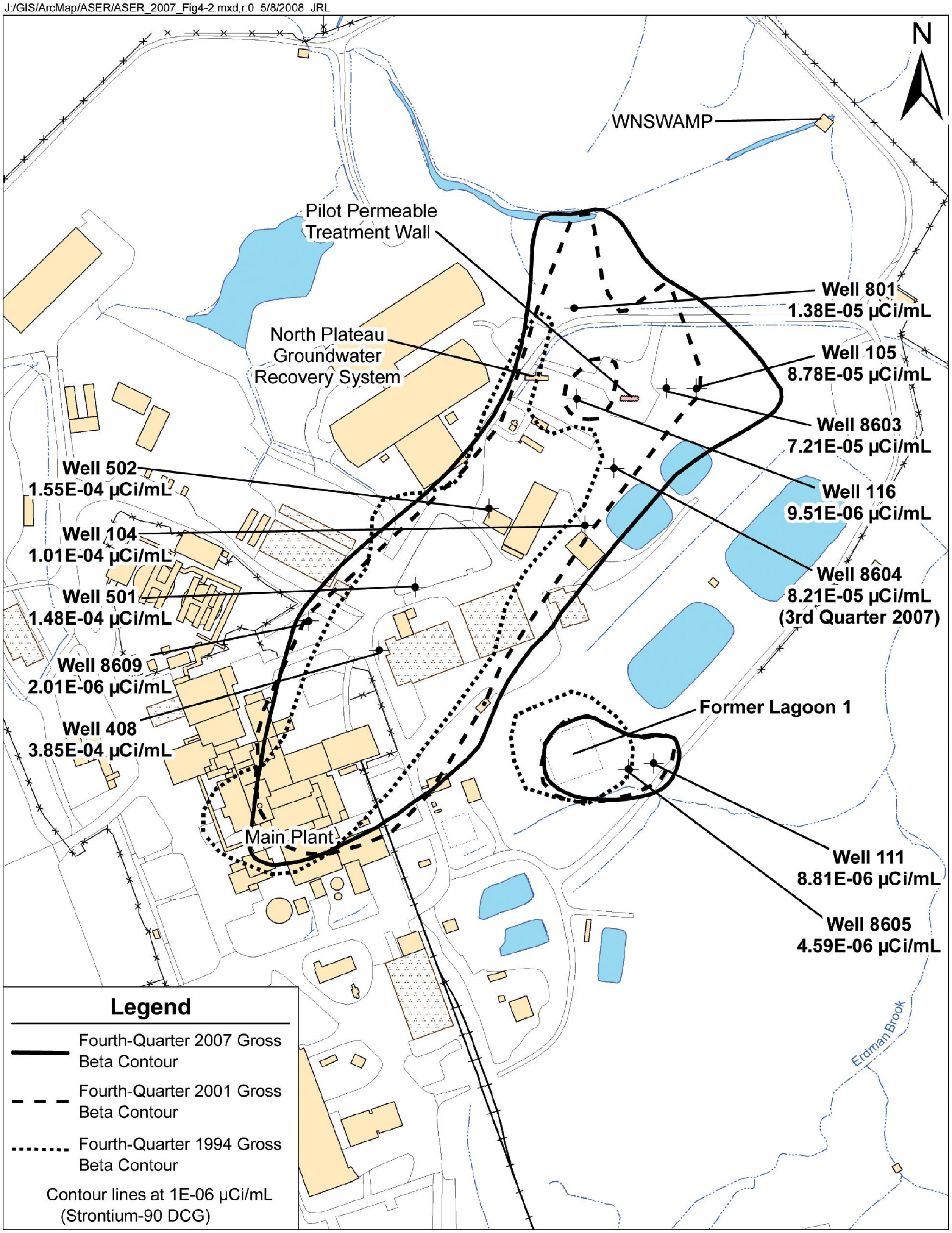
Gross beta activity was also detected in the area of former lagoon 1, which was backfilled in 1984. The source of this gross beta activity was presumed to be radiologically contaminated materials remaining within former lagoon 1. Two wells (8605 and 111) located downgradient of former lagoon 1 continue to exhibit elevated gross beta concentrations.

At the WVDP, DOE derived concentration guides (DCGs) may be used as a reference for evaluating liquid radionuclide effluents. Because there is no DCG for gross beta in liquid effluents, the strontium-90 DCG (1E-06 µCi/mL) is used as a conservative basis for comparison where beta-emitting radionuclides are detected in groundwater at the WVDP. For the purpose of the following discussions, the strontium-90 DCG is used interchangeably for comparisons with either gross beta or strontium-90. (See the “Useful Information” section at the end of this report for a discussion of the DOE DCGs, and Table UI-4 for a listing of the DCGs for all radionuclides of interest at the WVDP.)

Gross beta activity in groundwater within and around the north plateau plume continues to be monitored closely. Groundwater wells immediately downgradient of the MPPB, in the center of the plume, exhibited the highest gross beta and strontium-90 concentrations reported in the GMP monitoring wells in 2007. The maximum concentrations of gross beta and strontium-90 measured from groundwater wells in CY 2007 are listed in Table 4-6. Ten monitoring wells within the plume exhibited gross beta concentrations above the strontium-90 DCG in 2007. In the spring of 2008, an additional monitoring well (well 106) on the leading edge of the plume, also exceeded the DCG for strontium-90.

Figure 4-2 shows the fourth-quarter 2007 gross beta results from wells within the plume, and plots the outline of the plume where gross beta concentrations in groundwater exceeded the strontium-90 DCG in 1994, 2001, and 2007. A lengthening and shifting of the plume to the northeast over time is shown, indicating migration of the plume in the direction of

FIGURE 4-2
North Plateau Gross Beta Plume: Fourth-Quarter 1994, 2001, and 2007



groundwater flow. (See "Near-Term and Long-Term Plume Management Activities" later in this chapter.)

Groundwater is also monitored along the northeast edge of the north plateau where groundwater seeps from the steep banks of the stream channels incised by Erdman Brook and Franks Creek. (See Figs. A-2 and A-8 in Appendix A.) Gross beta concentrations from seep monitoring locations SP06, SP12, and GSEEP were close to or within background levels during 2007. However, gross beta concentrations at SP11 have increased from near background in 1999 to more than 1E-07 µCi/mL in 2007. The gross beta activity at SP11 is believed to be attributable to re-infiltration of contaminated water that has surfaced from the groundwater plume upgradient of this location. Gross beta concentrations in SP04 increased to approximately twice background in 2007. These levels of gross beta activity remain below the DOE DCG for strontium-90 of 1E-06 microcuries per milliliter (µCi/mL).

Gross beta results from the locations shown in Figure 4-2 are discussed below and gross beta trends over the last 10 years are displayed in Figures 4-3 through 4-5. These graphs are displayed on a log scale where an increase from one y-axis scale division to the next represents a 10-fold increase in concentration.

Figure 4-3 shows gross beta concentrations in wells 104, 408, 501, 502, and 8609 compared with site background concentrations. These wells are centrally located on the north plateau within the main portion of the plume. As in previous years, groundwater from well 408 continues to exhibit the highest gross beta concentrations of all GMP monitoring wells in the plume. Gross beta concentrations in well 408 and wells 104, 501, and 502 increased in 2007 as compared to 2006, after exhibiting steady or decreasing concentrations from 2002 through 2005. The gross beta concentrations measured in well 8609 during 2007 remained consistent with the concentrations reported in 2006.

Figure 4-4 shows gross beta concentrations in wells 105, 116, 801, 8603, and 8604 compared with site background concentrations. These wells are located further northeast than the preceeding group of wells and are further downgradient from the plume's presumed source beneath the MPPB. Figure 4-4 shows that concentrations are increasing in all five wells, indicating that downgradient plume migration continued in 2007. As in the past, groundwater from well 105, on the leading edge of the eastern lobe of the plume, showed the largest overall increase in concentrations from 1998 through 2007.

Figure 4-5 shows gross beta concentrations at wells 111 and 8605, located downgradient of former lagoon 1, compared with site background concentrations. Average concentrations at these two wells have remained relatively steady over time. Gross beta concentrations in well 111 during 2007 were very similar to those in 2006 and concentrations in well 8605 decreased slightly.

Northeast Swamp Drainage Monitoring. Routine radiological sampling continued during 2007 at surface water location WNSWAMP (on the WVDP premises). While gross beta and strontium-90 concentrations continued to fluctuate due to seasonal effects, the annualized average concentration of strontium-90 at this location remained above the DOE DCG throughout 2007. The main source of the elevated strontium-90 is believed to be groundwater from the north plateau plume seeping into the ditch upstream of WNSWAMP. (See Figures 4-2 and 4-6 in this Chapter and Figure A-2 in Appendix A.) An estimated 58 million gallons (219 million L) of water flowed through this monitoring point during 2007.

Monitoring downstream at the first point of public access in Cattaraugus Creek (at Felton Bridge [location code WFFELBR]) continued to show that gross beta concentrations were only slightly higher than those at the Cattaraugus Creek background location (at Bigelow Bridge [WFBIGBR]). (See also "Effluent Monitoring" in Chapter 2.)

Tritium. Residual tritium activity on the WVDP north plateau from previous activities on site during the period of fuel reprocessing operations has decreased as a result of radiological decay, as well as dilution from groundwater recharge and surface water infiltration. Current concentrations are close to or within the background range across most of the north plateau. Tritium concentrations in the seeps along the northeast edge of the north plateau are slightly higher than levels in background wells of the sand and gravel unit, but are still far below the DOE DCG for tritium of 2.0E-03 µCi/mL.

Small isolated areas of higher tritium concentrations still exist adjacent to or downgradient of the lagoon system and adjacent to the hardstand and lag storage areas. Well point WP-C is located in the center of the north plateau downgradient of the main plant, and contains the highest tritium concentrations of

WVDP environmental surveillance wells (see Table 4-6). Tritium concentrations in groundwater from all these areas are steadily decreasing.

Results for Volatile and Semivolatile Organic Compounds (VOCs and SVOCs). Selected wells within the sand and gravel unit continue to be monitored for VOCs and SVOCs, in accordance with the Consent Order. Currently, the only sand and gravel monitoring location with consistent positive detections of VOCs is well 8612, located northeast of the closed construction and demolition debris landfill (CDDL) at the northeast edge of the north plateau. (See Table 4-7 and Figure A-8 in Appendix A.) Figure 4-7 illustrates concentrations of organic compounds at well 8612. Two of these VOCs have been detected above the New York State Groundwater Effluent Limitations (Class GA); however these concentrations are steadily decreasing over time. At nearby well 803, benzene, ethyl benzene, toluene, and xylene were detected at concentrations less than the quantitation limit and below the NYS Class GA Effluent Limitations during one of four sampling events. The presence of VOCs in wells 803 and 8612, both downgradient of the CDDL, is presumed to be the result of wastes buried in the CDDL.

Downgradient of former lagoon 1, the SVOC tributyl phosphate (TBP) was detected when compared to the historic high of 700 micrograms per liter (µg/L) measured in December 1996, at decreasing levels, in groundwater samples from well 8605. TBP has also been detected in well 111, located near well 8605, but at concentrations close to or below the quantitation limit of 10 µg/L. (See Fig. 4-8.) Ongoing detection of TBP in this localized area may reflect residual contamination from liquid waste management activities in the former lagoon 1 area during earlier nuclear fuel reprocessing.

A summary of maximum concentrations of organic compounds detected in WVDP groundwater wells is shown in Table 4-7.

Strontium-90 Plume Remediation Activities

North Plateau Groundwater Recovery System. In 1995, the north plateau groundwater recovery system (NPGRS) was installed to minimize the advance of the strontium-90 plume. (See Fig. 4-2.) The NPGRS consists of three wells that extract contaminated groundwater, which is then treated by ion exchange to remove strontium-90. Treated water is transferred to the lagoon system and is ultimately discharged to Erdman Brook via the SPDES-permitted outfall.

The NPGRS operated with two wells pumping throughout 2007, processing about 2.90 million gallons (gal)

TABLE 4-7
Summary of Maximum Concentrations of Organic Constituents in Selected WVDP Groundwater Wells During 2007

Constituent	*Regulatory/Waste Management Monitoring Program*		*New York State Groundwater Effluent Limitations*[a] *Class GA (µg/L)*
	Well with the Highest Concentration	*Concentration Range (µg/L)*	
1,2-Dichloroethylene (total)	8612	20–26	5.0
1,1,1-Trichloroethane	8612	0.6–1.1 (estimated)	5.0
1,1-Dichloroethane	8612	5.4–8.0	5.0
Dichlorodiflouromethane	8612	2.4–3.7 (estimated)	5.0
Tributyl phosphate	8605	180–270	NA
Benzene	803	ND–0.9 (estimated)	1.0
Ethyl benzene	803	ND–0.6 (estimated)	5.0
Toluene	803	ND–4.2 (estimated)	5.0
Xylene	803	ND–3.5 (estimated)	5.0

Note: Constituents presented as "estimated" were reported at concentrations less than the practical quantitation limit.

NA - Not applicable.

ND - Not detected.

[a] Source: 6 NYCRR Part 703, Division of Water Technical and Operational Guidance Series 1.1.1, NYS Groundwater Effluent Limitations (Class GA).

(11.3 million liters [L]) of water. The system has recovered and processed approximately 49 million gal (186 million L) since November 1995.

North Plateau Groundwater Quality Early Warning Monitoring. Early-warning monitoring of water upgradient of the NPGRS is performed because this water is ultimately discharged off site via the New York State Pollutant Discharge Elimination System (SPDES)-permitted outfall 001. Semiannual monitoring results from well 502, located directly upgradient of the NPGRS, can be used to identify metals concentrations in groundwater that may affect compliance with the SPDES-permitted effluent limits. The levels of metals detected in groundwater from well 502 in CY 2007 were below concentrations likely to affect SPDES permit compliance.

Permeable Treatment Wall. A pilot-scale permeable treatment wall (PTW) was constructed in 1999 within the eastern lobe of the strontium-90 plume to test this passive, in-situ remediation technology. The pilot PTW is a trench that is backfilled with clinoptilolite, a medium selected for its ability to adsorb strontium-90 ions from groundwater. Strontium-90 concentrations are lower in groundwater from wells within the PTW, indicating that strontium-90 is being removed from the water that passes through the wall. However, throughout 2007, strontium-90 concentrations increased in two of the wells within the PTW to levels that may suggest the beginning of some reduction in treatment capacity in that area of the pilot PTW. The complex geology that exists in the vicinity of the pilot PTW is believed to affect the performance of the wall, and the wall itself may be affecting the pattern of groundwater flow in the plume area. The plume has encircled and migrated past the PTW test area. Nevertheless, the data indicate that the PTW technology can be an effective treatment method for strontium-90-contaminated groundwater.

Near-Term and Long-Term Plume Management Activities. Alternatives for management of the plume are currently being evaluated by the DOE. Groundwater monitoring data are being used to evaluate the current conditions of the plume and to model the future plume configuration under differing near-term and long-term management scenarios.

Near-term strategies are focused on ways to reduce migration of the downgradient leading edge of the plume, thereby minimizing expansion beyond its current mapped limits and migration into downgradient surface water and seepage points. The proposed management strategies may include implementation of permeable reactive barrier technology, a full-scale permeable treatment wall, hydraulic barriers such as an interceptor trench, groundwater extraction wells, or a combination of these technologies. The implementation of the near-term plume management strategy is integral to the starting point of the environmental impact statement (EIS) for the WVDP, to manage and minimize the release of contamination off site while the EIS for the Decommissioning and/or Long-Term Stewardship at the WVDP and the WNYNSC is finalized.

Long-term strategies include remedial alternatives that would contain the plume so that it can be effectively removed and/or allowed to decay in-place within the WVDP premises. These strategies will be integrated with the near-term plume management options and will be evaluated in the WVDP Decommissioning EIS.

Sampling projects are planned for 2008 to obtain plume and subsurface characterization data for decision-making for both the near-term and long-term management strategies.

Groundwater Sampling Observations on the South Plateau: Weathered Lavery Till and the NDA

In 1990, a trench system was constructed through the weathered Lavery till along the northeast and northwest sides of the NDA to intercept and collect groundwater that was potentially contaminated with a mixture of radioactive n-dodecane and tributyl phosphate. (See also "Interim Measures; NDA Cap" in the Environmental Compliance Summary and "Nuclear Regulatory Commission [NRC]-Licensed Disposal Area [NDA] Interceptor Trench and Pretreatment System" in Chapter 1.) Monitoring results in 2007 detected no TBP in NDA interceptor trench groundwater. Groundwater elevations are monitored quarterly in and around the trench to ensure that an inward gradient is maintained, thereby minimizing outward migration of potentially contaminated groundwater.

NDA Monitoring. Gross beta and tritium concentrations in groundwater from sampling location WNNDATR, a sump at the lowest point of the interceptor trench, and from well 909, downgradient of WNNDATR (Fig. A-9 in Appendix A), continued to be elevated with respect to concentrations in background monitoring locations on the south plateau. Gross beta concentrations at WNNDATR have increased with time, with even steeper increases observed from 2005 through 2007. Gross beta concentrations at unweathered lavery till well 910 became elevated above the DOE DCG at the end of 2007. This is believed to be caused by a broken well coupling that is allowing shallow contaminated groundwater, and/or surface water that had been previously identified on the surface of the NDA, to enter the well. Following a hydrogeological evaluation, this well was decommissioned and a replacement well was installed to continue monitoring coverage for the unweathered Lavery till in this area.

Residual activity from historical site operations in the NDA is the presumed source of this gross beta activity. Similar to the north plateau, strontium-90 is the predominant contributing radioisotope.

Tritium concentrations at WNNDATR were slightly lower during 2007 than those in 2006, and overall have decreased since 1994. WNNDATR contained the highest tritium concentrations reported in the WVDP regulatory/waste management groundwater monitoring locations (see Table 4-6). Detections of tritium in the NDA are presumed to be the result of residual activity from former burial operations on the south plateau. Tritium concentrations remain well below the DOE DCG for tritium. Currently, groundwater flowing through the NDA is collected at WNNDATR and is transferred to the low-level waste treatment facility for processing.

NDA Interim Measure (IM). An IM work plan for the NDA was completed under the Consent Order in 2007, with the stated goals being to improve the integrity of the earthen cap and to limit water infiltration. The IM, which will be implemented in 2008, will include the installation of a geosynthetic cap over the NDA, a low-permeability subsurface groundwater cutoff wall (slurry wall) upgradient of the NDA, and surface water drainage diversions.

Refer to Environmental Compliance Summary "Interim Measures" under "RCRA §3008(h) Order on Consent" for further discussion of the NDA Cap.

Additional Monitoring and Investigations

Radioisotopic Sampling. In addition to routine sampling of groundwater for gross alpha, gross beta, tritium, and strontium-90 (at specific wells, as indicated in Table 4-2), select groundwater samples from the sand and gravel unit, the weathered Lavery till unit, and the unweathered Lavery till unit are analyzed for a more extensive list of radionuclides (also indicated in Table 4-2). These samples are analyzed for the additional radionuclides carbon-14, technetium-99, iodine-129, cesium-137, radium-226, radium-228, uranium-232, uranium-233/234, uranium-235/236, and uranium-238. (Note that radium-

TABLE 4-8
2007 Maximum Concentrations (µCi/mL) of Radionuclides[a] in Groundwater at the WVDP

Well	*Tc-99*	*I-129*	*Ra-226*	*Ra-228*	*U-233/234*	*U-238*
Sand and Gravel						
WNW0401[b]	--	--	--	9.80±4.13E-10	2.27±1.04E-10	--
WNW0408	1.10±0.28E-08	--	1.06±0.41E-09	3.89±0.82E-09	--	2.90±1.40E-10
WNW0706[b]	--	--	3.59±1.67E-10	--	--	--
WNW1302	--	--	5.86±2.49E-10	--	--	--
WNW1304	--	--	2.18±0.40E-09	--	2.86±1.43E-10	2.21±0.98E-10
Weathered Lavery Till						
WNW0909	--	5.63±1.49E-09	--	--	5.12±1.53E-10	4.48±1.44E-10
WNNDATR	--	1.46±0.55E-09	--	--	1.86±0.36E-09	1.30±0.31E-09
Unweathered Lavery Till						
WNW0405[b]	--	--	5.42±1.99E-10	--	4.72±1.46E-10	3.43±1.53E-10

Note: "--" indicates that the radionuclide was not postively identified at this location.

[a] Results for tritium and strontium-90, discussed earlier, are not included in this summary. Routine monitoring locations with no positive detections of additional radionuclides are not listed, nor are sampled radionuclides that were not positively detected at any of the locations.

[b] Background well

226, radium-228, uranium-234, and uranium-238 occur naturally in the environment.)

Historical monitoring of these select wells has resulted in positive detections of carbon-14, technetium-99, iodine-129, radium-226, radium-228, uranium-233/234, and uranium-238. All of these radionuclides, with the exception of carbon-14, were detected in groundwater in 2007. The maximum concentrations of each are presented in Table 4-8. Note that wells 401, 405, and 706 serve as background wells.

As discussed earlier, strontium-90 concentrations were found to be elevated in monitoring wells in the north plateau plume area and also downgradient of the NDA on the south plateau. On the north plateau, in addition to strontium-90, positive concentrations of technetium-99, radium-226, radium-228, and uranium-238 were reported in well 408, the GMP well closest to the strontium-90 plume source and located within the main flow path of the plume. Concentrations of technetium-99 at this well are decreasing over time, while the concentrations of the remaining radionuclides appear consistent with historical results.

Although not included in Table 4-8, special sampling as part of the waste tank farm (WTF) hydrogeologic investigation (discussed later in this chapter) detected technetium-99 and radium-228 at well 8607, located adjacent to the lag storage area. This activity is attributed to residual contamination from historical activities in the vicinity of the WTF.

Radium-226, a decay product of uranium-238, was detected in several of the wells adjacent to the remote-handled waste facility (405, 706, 1302, and 1304). The reported concentration of radium-226 at well 1304 appears to be an outlier, since typical concentrations measured previous to and subsequent to the result reported in Table 4-8 are much lower. Concentrations of radium-226 at the remaining wells adjacent to the RHWF are consistent with historical results.

At location WNNDATR and well 909 on the south plateau, concentrations of iodine-129, uranium-233/234, and uranium-238 were reported above the detection limit and above background levels. The concentrations of iodine-129 remain elevated above background and are consistent with historical results. Elevated radionuclide concentrations in groundwater downgradient of the NDA are presumed to be associated with former burial operations.

Groundwater Monitoring Downgradient of the WTF. The waste in the underground tanks has been solidified through the vitrification process and the tanks remain in place containing residual waste. In 2005, the New York State Department of Environmental Conservation requested that the DOE evaluate the current and historical groundwater conditions in the vicinity of the WTF. Throughout waste processing activities, groundwater controls were in place to (1) reduce the upward hydrostatic pressure on the tanks, and (2) to maintain an inward hydraulic gradient toward the tanks, thereby inhibiting any potential leaks from the tanks. The natural inward hydraulic gradient is influenced by periodically pumping a dewatering well (DWW), located outside the vault, that controls the hydrostatic pressure in the immediate vicinity of the tanks.

Radioactivity in groundwater in the vicinity of the WTF is routinely monitored and evaluated. Elevated gross beta concentrations in groundwater from well 8607 have been observed since 1994, with the maximum concentration measured in 2005. Gross beta activity has also been observed in the DWW and the tank 8D-2 pan. Radionuclide samples from these locations were collected in 2007 to determine the source(s) of the gross beta activity. After evaluating the radiological results, it was concluded that the gross beta activity in well 8607 is most likely attributed to residual contamination from historical events in and around the WTF (i.e., minor leaks from condensate lines or the WTF underdrain) and is not believed to have originated from the tanks themselves.

Investigation of Chromium and Nickel in the Sand and Gravel Unit and Evaluation of Corrosion in Groundwater Monitoring Wells. A 1997 and 1998 study of the effect of modifying sampling equipment and methodology on concentrations of chromium and nickel in groundwater samples from the sand and gravel unit noted that such modifications produced decreases in these concentrations. This finding supported the hypothesis (which is documented in the technical literature) that elevated concentrations of nickel and chromium were not representative of actual groundwater conditions, but were caused by the release of metals from subsurface corrosion of stainless-steel well materials (WVNSCO and Dames & Moore, June 1998).

To ensure that the integrity of the monitoring wells is maintained, and to ensure that samples representative of actual groundwater conditions are collected, wells are periodically inspected for corrosion. Approximately 75% of the stainless-steel wells monitoring the sand and gravel unit were internally inspected for corrosion during 2001. At that time, wells with corrosion were cleaned and reinspected to verify that corrosion had been removed. Since 2001, select wells have been inspected and cleaned when elevated nickel and chromium were observed. An inspection and cleaning project was planned for CY 2007, but was postponed due to equipment problems. This project will be rescheduled for CY 2009.

Monitoring for Metals. Selected wells in the sand and gravel unit are monitored for metals as required by the RCRA 3008(h) Consent Order. During 2007, a select number of additional wells were sampled for metals analysis to help establish baseline concentrations for metals in groundwater. These data will be evaluated in conjunction with sample data being collected in 2008 to support north plateau background and characterization sampling programs.

Off-Site Groundwater Monitoring. Groundwater is used as a potable water supply at off-site private residences near the WVDP. None of the wells draw from groundwater units that underlie the site. Groundwater samples have been collected routinely from nine off-site residential supply wells within 4.3 miles (7 kilometers [km]) of the Project that represent the closest unrestricted use of groundwater. One additional upgradient well, located 18 miles (29 km) south of the site, was also sampled for background purposes. Sampling of these 10 wells was discontinued since they do not intercept groundwater downgradient of the site. This modification to the monitoring program was presented as part of the 2007 monitoring evaluation. Additional information is provided in "Drinking Water Monitoring" in Chapter 2.

Fuel Receiving and Storage (FRS) Pool Water Infiltration. During mid-2005, water was found trickling into the empty FRS pool during a quarterly inspection. The water had accumulated to approximately four to six inches. The water is directed by a slope in the floor to a deeper stainless-steel-lined cask unloading pool (CUP). Analytical data for the FRS CUP water indicate that groundwater seepage is the source of the water. During periods of high precipitation or snow melt, slight seepage has entered along the south wall. The elevated cesium-137 concentrations are believed to be from residuals that adhered to the FRS walls when the pool was full. Groundwater seepage into the pool is thought to have dissolved some of the cesium. Since the water does not pose operational or safety concerns, it has been left in the CUP under routine monitoring. Currently, the water level in the CUP is measured daily by facility operators and samples of the water are analyzed periodically.

FIGURE 4-3
Average Annual Gross Beta Concentrations at Monitoring Wells Centrally Located Within the North Plateau Plume

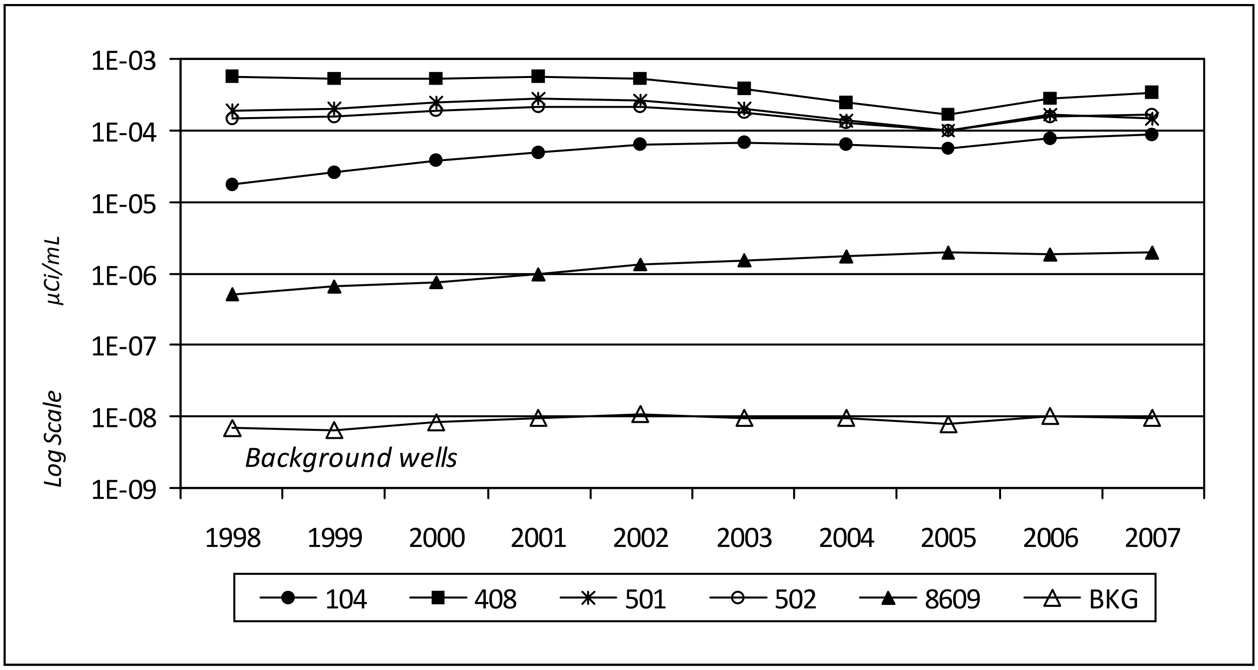


FIGURE 4-4
Average Annual Gross Beta Concentrations at Monitoring Wells Near the Leading Edge of the North Plateau Plume

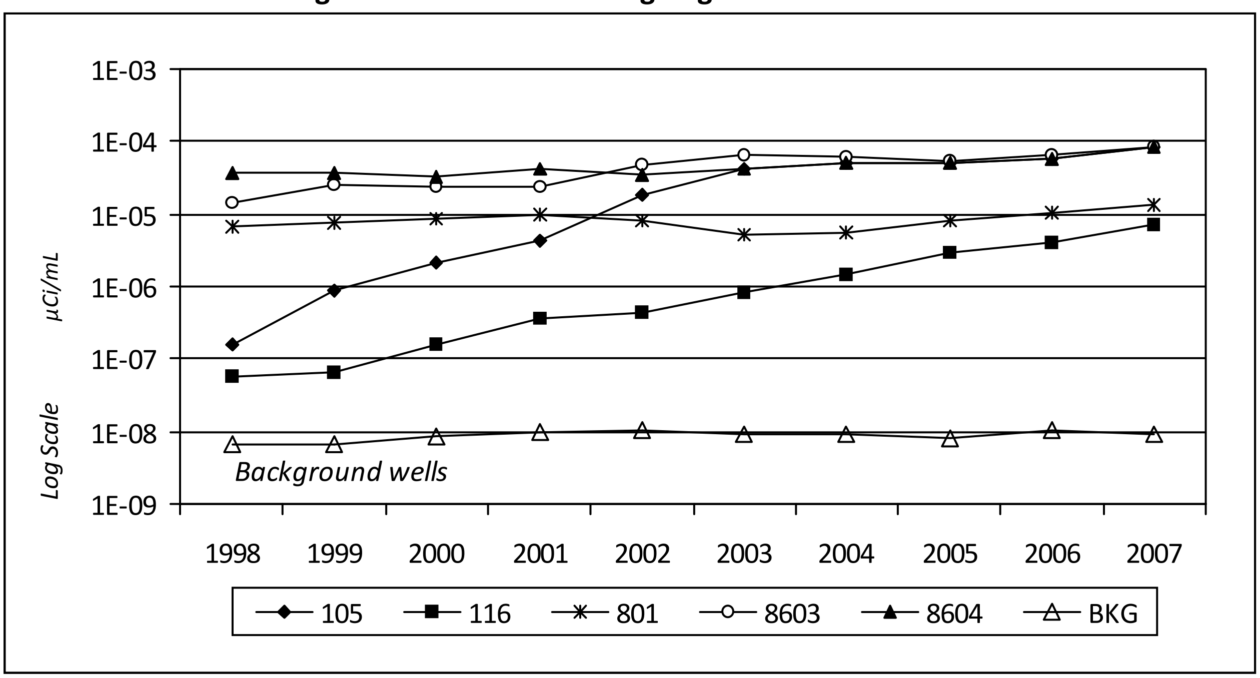


FIGURE 4-5
Average Annual Gross Beta Concentrations at Monitoring Wells Near Former Lagoon 1

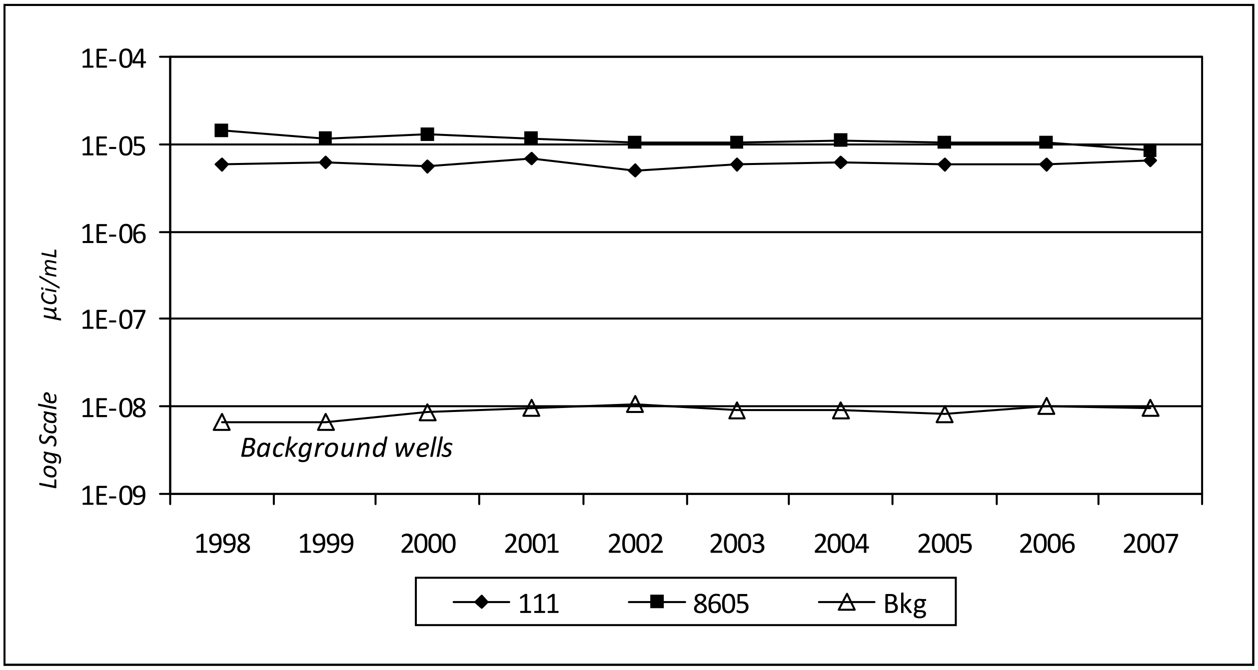
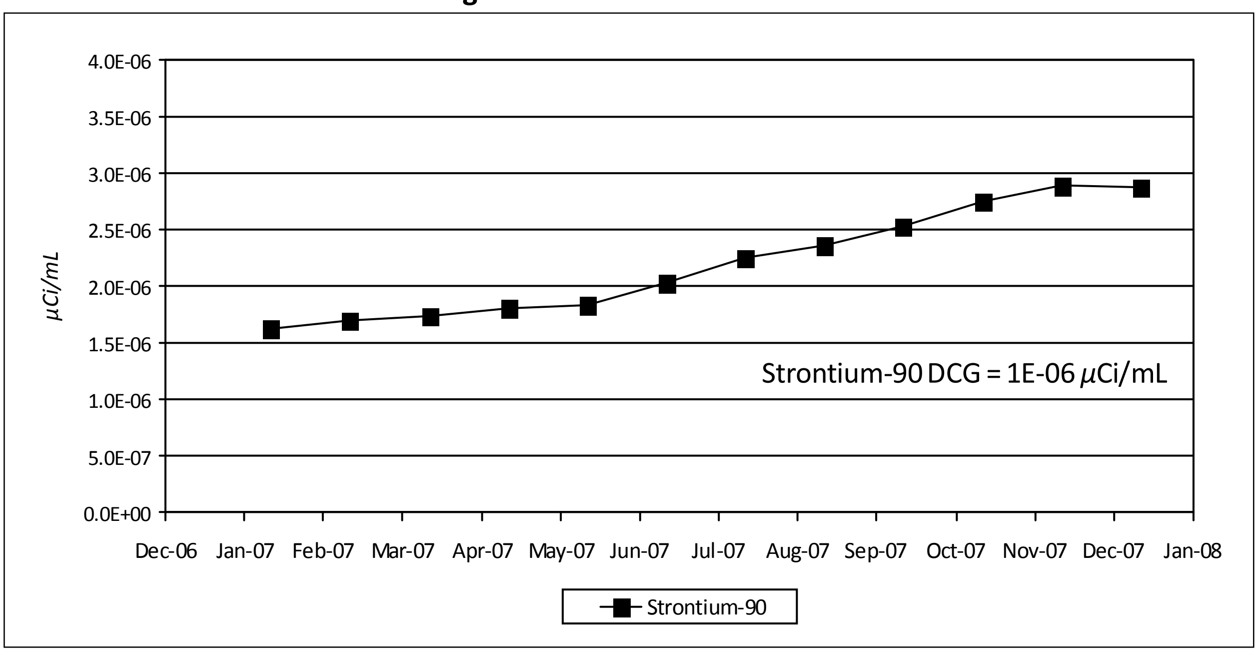


FIGURE 4-6
2007 Annualized Average Strontium-90 Concentrations at WNSWAMP



Note: DCGs are used as an evaluation tool for results from on-site locations as part of the routine environmental monitoring program. However, DOE DCGs are applicable only at locations accessible to members of the public. The WNSWAMP location is not accessible to the public.

FIGURE 4-7
Concentrations of 1,2-DCE-t, 1,1,1-TCA, 1,1-DCA, and DCDFMeth at Well 8612 in the Sand and Gravel Unit

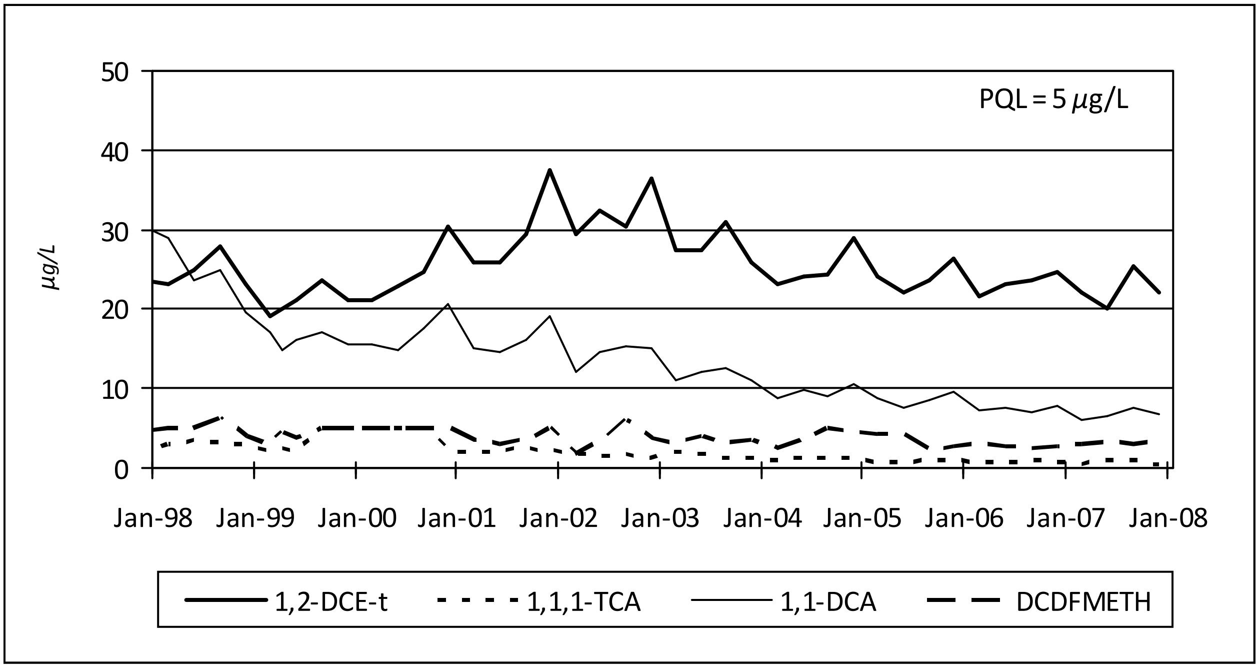


FIGURE 4-8
Concentrations of Tributyl Phosphate at Monitoring Wells Near Former Lagoon 1 in the Sand and Gravel Unit

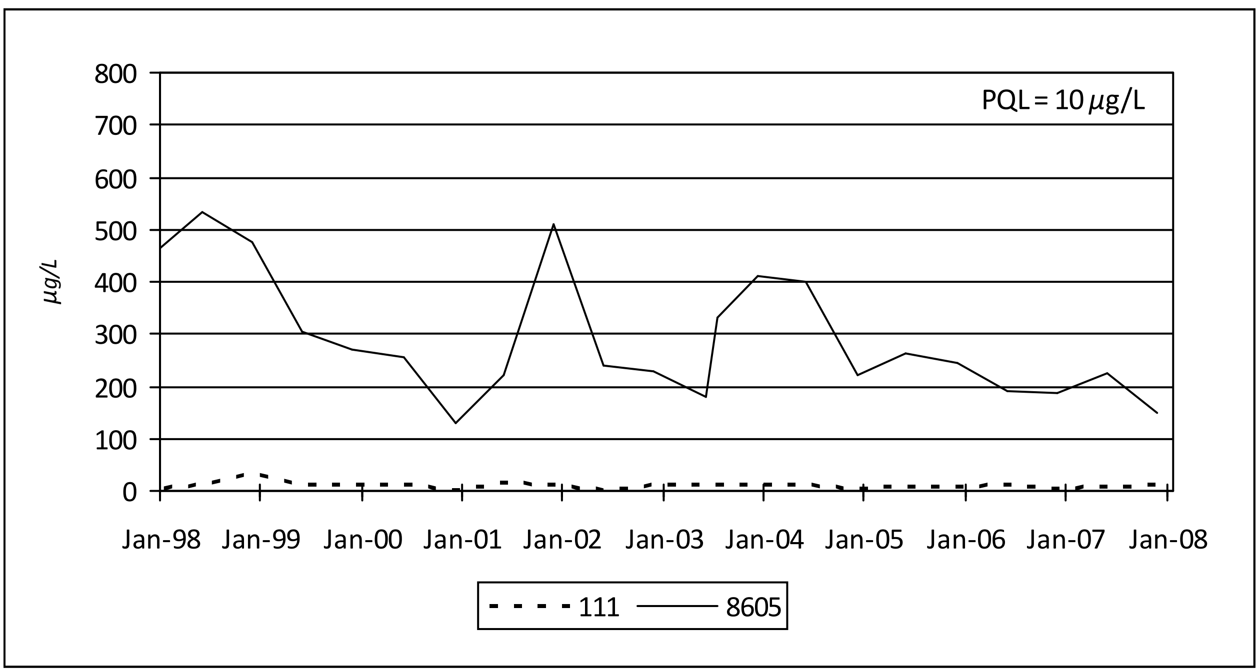
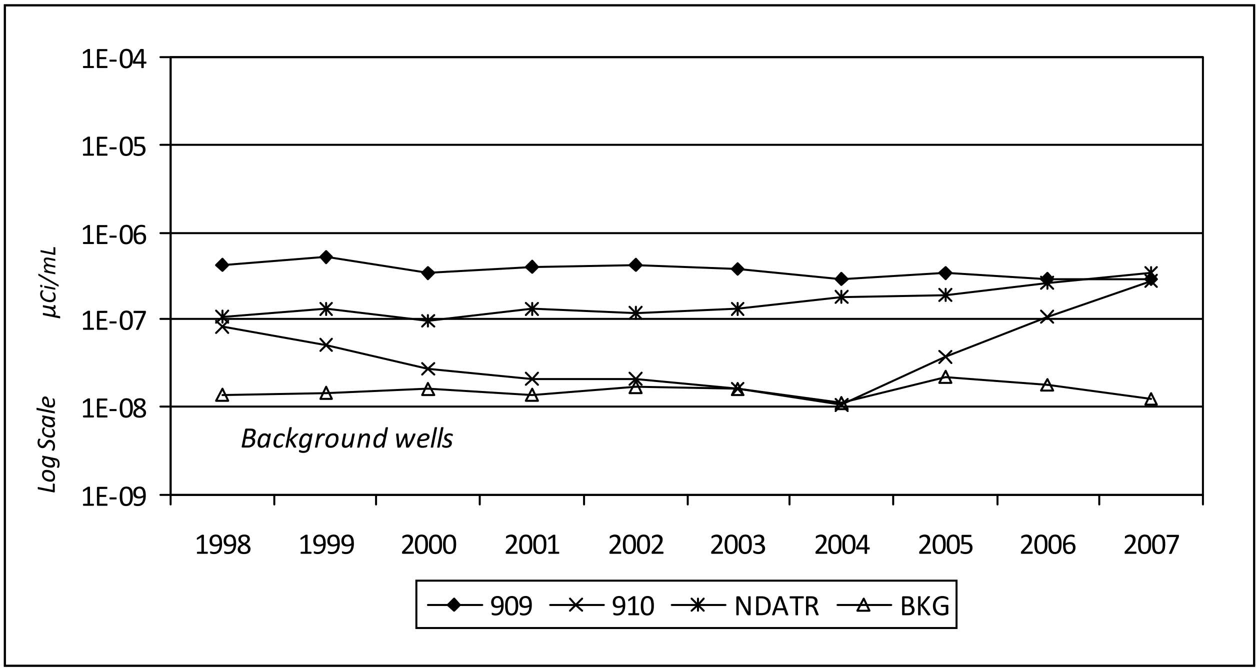


FIGURE 4-9
Average Annual Gross Beta Concentrations at Monitoring Wells Downgradient of the NDA



APPENDIX A

2007 Environmental Monitoring Program

Environmental Monitoring Program Drivers and Sampling Rationale

The following schedule represents the West Valley Demonstration Project (WVDP) routine environmental monitoring program for 2007. This schedule met or exceeded the requirements of the United States (U.S.) Department of Energy (DOE) Order 450.1, "Environmental Protection Program," DOE Order 5400.5, "Radiation Protection of the Public and the Environment," and DOE/EH-0173T, "Environmental Regulatory Guide for Radiological Effluent Monitoring and Environmental Surveillance." Specific methods and monitoring program elements were based on DOE/EP-0096, "A Guide for Effluent Radiological Measurements at DOE Installations," and DOE/EP-0023, "A Guide for Environmental Radiological Surveillance at U.S. Department of Energy Installations." Additional monitoring was mandated by air and water discharge permits (under the National Emission Standards for Hazardous Air Pollutants [NESHAP] regulations in 40 Code of Federal Regulations (CFR) 61, Subpart H, and the New York State Pollutant Discharge Elimination System [SPDES], respectively). Specific groundwater monitoring is required by the Resource Conservation and Recovery Act (RCRA) §3008(h) Administrative Order on Consent.

Permits, agreements, and/or programs may require formal reports of monitoring results. Radiological air emissions from the WVDP are reported annually in the NESHAP report to the U.S. Environmental Protection Agency. Nonradiological releases in water effluent and storm water drainage points covered under SPDES permit are reported monthly to the New York State Department of Environmental Conservation (NYSDEC) in a Discharge Monitoring Report. Groundwater monitoring results are reported quarterly to NYSDEC. Annual results from the monitoring program as a whole are evaluated and discussed in this ASER, which is prepared as directed in DOE Order 231.1A, "Environment, Safety, and Health Reporting," and associated guidance.

Table A-1 summarizes programmatic drivers and guidance applicable to each environmental medium measured or sampled as part of the WVDP Environmental Monitoring Program.

Sampling Schedule

Sampling locations are assigned a specific identifier, the location code, which is used to schedule sampling, track samples, and trace analytical results. This appendix details the sampling schedule conducted at each location in 2007. Changes since the last ASER are summarized on page A-18. Sampling locations are shown on Figs. A-2 through A-14. Table headings in the schedule are as follows:

- **Sample Location Code.** This code describes the physical location where the sample is collected. The code consists of seven or eight characters: The first character identifies the sample medium as **A**ir, **W**ater, **S**oil/sediment, **B**iological, or **D**irect measurement. The second character specifies o**N**-site or o**F**f-site. The remaining characters describe the specific location (e.g., **AFGRVAL** is **A**ir o**F**f-site at **GR**eat **VAL**ley). Distances noted at sampling locations are as measured in a straight line from the ventilation stack of the main plant process building on site.

- **Sampling Type/Medium.** Describes the collection method and the physical characteristics of the medium or sample.

- **Collection Frequency/Total Annual Samples.** Indicates how often the samples are collected or retrieved and the total number of each type of sample processed in one year.

- **Measurements/Analyses.** Notes the type of measurement taken from the sampling medium and/or the constituents of interest, and (in some instances) the type of analysis conducted.

TABLE A-1
WVDP Environmental Program Drivers and Sampling Rationale

Programmatic Drivers	*Sampling Rationale*
On-Site Air Emissions (Appendix A, p. A-6)	
40 CFR 61, Subpart H (radiological air emissions); DOE O 450.1	DOE/EH-0173T, Chapter 3.0 (air effluent monitoring); DOE/EP-0096, Section 3.3 (criteria for effluent measurements)
Ambient Air (Appendix A, p. A-6 [on-site], and A-15 [off-site])	
DOE O 450.1	DOE/EH-0173T, Sections 3.3.2 (air effluent monitoring, diffuse sources) and 5.7.4 (environmental surveillance, air sampling locations); DOE/EP-0023, Section 4.2.3 (air sampling locations and measurement techniques)
On-Site Liquid Effluents and Storm Water (Appendix A, pp. A-7 through A-10)	
New York State SPDES Permit No. NY 0000973 (nonradiological; specified points only), DOE O 450.1 and DOE O 5400.5 (radiological)	DOE/EH-0173T, Section 2.3.3 (sampling locations for effluent monitoring); NYSDOH ELAP (Environmental Laboratory certification for nonpotable water)
Surface Water (Appendix A, pp. A-10 and A-11 [on-site] and A-13 and A-14 [off-site])	
DOE O 450.1	DOE/EH-0173T, Section 5.10.1 (environmental surveillance water sampling locations and methods); NYSDOH ELAP (Environmental Laboratory certification for nonpotable water)
Potable (Drinking) Water (Appendix A, pp. A-11 [on-site] and A-14 [off-site])	
DOE O 450.1	DOE/EH-0173T, Section 5.10 (basis and guidance for environmental surveillance, water); NYSDOH ELAP (Environmental Laboratory certification for nonpotable water)
On-Site Groundwater (Appendix A, pp. A-11 through A-13)	
RCRA §3008(h) Order on Consent (nonradiological); DOE O 450.1	DOE/EH-0173T, Section 5.10 (basis for environmental surveillance, water); NYSDOH ELAP (Environmental Laboratory certification for nonpotable water)
Fallout Precipitation (Appendix A, p. A-14)	
DOE O 450.1	DOE/EP-0023, Section 4.7 (deposition assessment); NYSDOH ELAP (Environmental Laboratory certification for nonpotable water)
Soil and Sediment (Appendix A, p. A-15 [on-site and off-site])	
DOE O 450.1	DOE/EH-0173T, Sections 5.9 (environmental surveillance, terrestrial foodstuffs) and 5.11 (aquatic foodstuffs)
Direct Radiation (Appendix A, p. A-17 [on-site and off-site])	
DOE O 450.1	DOE/EH-0173T, Section 5.5 (environmental surveillance external radiation measurement locations and frequency); DOE/EP-0023, Section 4.6 (external radiation)

Index of Environmental Monitoring Program Sample Points

[a] Not detailed on map.

Index of Environmental Monitoring Program Sample Points *(continued)*

Liquid Effluent, On-Site Water, and Storm Water Outfalls (Figs. A-2 through A-4) *(concluded)* **Page**

[a] Not detailed on map.

Index of Environmental Monitoring Program Sample Points *(continued)*

Index of Environmental Monitoring Program Sample Points *(concluded)*

[a] Near-site and background produce samples (corn, apples, and beans) are identified specifically as follows: corn = **BFVNEAC** and **BFVCTRC**; apples = **BFVNEAAF** and **BFVCTRA**; beans = **BFVNEAB** and **BFVCTRB**.

Sample Location Code	*Sampling Type/ Medium*	*Collection Frequency/ Total Annual Samples*	*Measurements/Analyses*
On-Site Air Emissions			
ANSTACK[a] Main plant process building ventilation exhaust stack **ANSTSTK**[a] Supernatant treatment system ventilation exhaust **ANCSSTK**[a] 01-14 building ventilation exhaust **ANCSRFK**[a] Contact size-reduction facility exhaust **ANCSPFK**[a] Container sorting and packaging facility exhaust **ANVITSK**[a] Vitrification heating, ventilation, and air conditioning exhaust **ANRHWFK**[a] Remote-handled waste facility exhaust	Continuous off-line air particulate monitors	Continuous measurement of fixed filter; replaced biweekly; held as backup	Real-time alpha and beta monitoring
	Continuous off-line air particulate filters	Biweekly; 26 each location	Gross alpha/beta, gamma isotopic[b] upon collection, flow
	Composite of biweekly particulate filters	Semiannually; 2 each location	Sr-90, U-232, U-233/234, U-235/236, U-238, total U, Pu-238, Pu-239/240, Am-241, gamma isotopic, flow
	Continuous off-line desiccant columns for collection of water vapor	Biweekly; 26 each at ANSTACK and ANSTSTK only	H-3, flow
	Continuous off-line charcoal cartridges	Cartridges collected biweekly and composited into 2 semiannual samples at each location	I-129
OVEs/PVUs[a] **Outdoor ventilated enclosures/portable ventilation units**	Continuous off-line air particulate filter	Collected as required by project	Gross alpha/beta, gamma isotopic[b] upon collection, flow
	Composite of filters	Semiannually; 2 each location	Sr-90, U-232, U-233/234, U-235/236, U-238, total U, Pu-238, Pu-239/240, Am-241, gamma isotopic, flow
ANLAGAM Lag storage area ambient air	Continuous off-line air particulate filter	Biweekly; 26 per year	Gross alpha/beta, flow
	Composite of biweekly filters	Semiannually; 2 per year	Sr-90, U-232, U-233/234, U-235/236, U-238, total U, Pu-238, Pu-239/240, Am-241, gamma isotopic, flow

[a] Required by 40 CFR 61, Subpart H. Results reported in the Annual NESHAP Report and evaluated in this ASER.
[b] Gamma isotopic analysis done only if gross alpha/beta activity rises significantly.

Sample Location Code	***Sampling Type/ Medium***	***Collection Frequency/ Total Annual Samples***	***Measurements/Analyses***
On-Site Liquid Effluents			
WNSP001[a] Lagoon 3 discharge weir	Grab liquid	Daily during discharge. Lagoon 3 is discharged 4 to 8 times per year, averaging 6 to 7 days per discharge; 24–56 per year	Daily flow, hold for flow-weighted composite
	Grab liquid	Twice during discharge; 8–16 per year	Gross alpha/beta, H-3, Sr-90, gamma isotopic
	Flow-weighted composite of daily samples for each discharge	4 to 8 per year	Gross alpha/beta, H-3, C-14, Sr-90, Tc-99, I-129, gamma isotopic, U-232, U-233/234, U-235/236, U-238, total U, Pu-238, Pu-239/240, Am-241
	24-hour composite liquid	Twice during discharge; 8–16 per year	BOD_5, TSS, SO_4, NO_3-N,NO_2-N, NH_3, total Fe and Hg (method 1631)
	Grab liquid	Twice during discharge; 8–16 per year	Settleable solids, TDS, oil & grease, total recoverable Se
	24-hour composite liquid	Once during discharge; 4–8 per year	Total Al, dissolved As, dissolved sulfide
	Grab liquid	Once during discharge; 4–8 per year	pH, total recoverable V, Co
	24-hour composite liquid	Quarterly; 4 per year	Bromide and total B, total recoverable Pb
	24-hour composite liquid	Semiannually; 2 per year	Total Ti, Mn, dissolved Cu, total recoverable Cu, Cr, Ni, and Zn
	24-hour composite liquid	Annually; 1 per year	Total recoverable Cd, total Ba and Sb
	Grab liquid	Semiannually; 2 per year	Heptachlor, cyanide amenable to chlorination, surfactant (as LAS)
	Grab liquid	Annually; 1 per year	Chloroform, dichlorodifluoromethane, trichlorofluoromethane, 3,3-dichlorobenzidine, tributyl phosphate, hexachlorobenzene, alpha-BHC, xylene, 2-butanone, total recoverable Cr^{+6}
WNSP01B[a] Internal process monitoring point	Continuous measurement; recorded weekly	NA	Flow
	Continuous; recorded monthly	NA	Elapsed flow time
	Composite liquid	Twice per month when operating; 0–24 per year	Total Hg
WNSP116[a] Pseudo-monitoring point outfall 116	Calculated	Twice per lagoon discharge; 8–16 per year	TDS

NA - Not applicable

[a] Required by SPDES Permit #NY0000973. Results reported in the SPDES DMR and evaluated in this ASER.

Sample Location Code	*Sampling Type/ Medium*	*Collection Frequency/ Total Annual Samples*	*Measurements/Analyses*
On-Site Liquid Effluents			
WNSP007[a] Sanitary waste discharge	24-hour composite liquid	2 per month; 24 per year	Gross alpha/beta, H-3
	Composite of monthly samples	Semiannually; 2 per year	Sr-90, gamma isotopic
	24-hour composite liquid	3 per month; 36 per year	TSS, NH_3, NO_2-N, BOD_5, total Fe, flow
	Grab liquid	3 per month; 36 per year	Oil & grease
	Grab liquid	Weekly; 52 per year	pH, settleable solids, total residual chlorine
	Grab liquid	Annually; 1 per year	Chloroform
	Grab liquid	Monthly; 12 per year	Flow, flow time
WNURRAW[a] Utility room raw water	Composite liquid	Weekly; 52 per year	Total Fe
	Grab liquid	Two per lagoon discharge; near start, and near end; 8–16 per year	TDS
	Direct field measurement	Monthly; 12 per year	Monthly flow
	Grab liquid	Quarterly; 4 per year	TOC, alkalinity
WNSP006 Franks Creek at the security fence	Timed continuous composite liquid	Weekly during lagoon discharge, otherwise biweekly; 26–34 per year	Gross alpha/beta, H-3
	Composite of weekly and biweekly samples	Monthly; 12 per year[b]	Sr-90 and gamma isotopic
	Composite of weekly and biweekly samples	Quarterly; 4 per year	C-14, Tc-99, I-129, U-232, U-233/234, U-235/236, U-238, total U, Pu-238, Pu-239/240, Am-241
	Grab liquid	Two per lagoon discharge, before start, and after end 8–16 per year	TDS, flow
	Grab liquid	Monthly; 12 per year	Hardness (Ca and Mg)
	Grab liquid	Semiannually; 2 per year	Temperature (field), pH (field), dissolved oxygen (field), TOX, oil & grease
	24-hour timed continuous composite liquid	Semiannually; 2 per year	TSS, NPOC, NH_3 (as N), NO_3 (as N), NO_2 (as N), bromide, fluoride, chloride, sulfate, total sulfide, surfactant (as LAS). Alpha-BHC, B, Ba, Co, Fe, Na, Mn, Sb, Ti, Tl, V, dissolved Al, As, Cd, Cr, Cu, Hg (method 1631), Ni, Pb, Se, Zn
WNSP008[a] French drain (Capped off in 2001; routinely checked to verify no discharge)	Grab liquid	Monthly; 12 per year if discharging	Gross alpha/beta, H-3
	Grab liquid	Three per month if discharging; 36 per year	Conductivity, pH, BOD_5, total Fe, total recoverable Cd and Pb, flow
	Grab liquid	Annually; 1 per year if discharging	Total As, Cr, Ag, and Zn

[a] Required by SPDES Permit #NY0000973. Results reported in the SPDES DMR and evaluated in this ASER.
[b] Sample shared with NYSDOH

Sample Location Code	*Sampling Type/ Medium*	*Collection Frequency/ Total Annual Samples*	*Measurements/Analyses*
Storm Water Outfalls			
Group 1[a] **WNSO02 (S02)** **WNSO04 (S04)**	First flush grab liquid	Semiannually; 2 per year	pH, oil & grease, BOD_5, TSS, TDS, total P, Al, Fe, total recoverable Cu, Pb, Zn, Cd, Cr, Se, V, Cr^{+6}, TKN, ammonia (as NH_3), NO_3-N, NO_2-N, total nitrogen (as N)
	Flow-weighted composite liquid	Semiannually; 2 per year	Total flow, plus all of the above constituents except for pH and oil & grease
Group 2[a] **WNSO06 (S06)** **WNSO33 (S33)**	First flush grab liquid	Semiannually; 2 per year	pH, oil & grease, BOD_5, TSS, TDS, total P, Al, Fe, total recoverable Cu, Pb, Zn, surfactant (as LAS)
	Flow-weighted composite liquid	Semiannually; 2 per year	Total flow, plus all of the above constituents except for pH and oil & grease
Group 3[a] **WNSO09 (S09)** **WNSO12 (S12)**	First flush grab liquid	Semiannually; 2 per year	pH, oil & grease, BOD_5, TSS, TDS, total P, Al, Fe, total recoverable Cu, Pb, Zn, TKN, ammonia (as NH_3), NO_3-N, NO_2-N, alpha-BHC, total nitrogen (as N)
	Flow-weighted composite liquid	Semiannually; 2 per year	Total flow, plus all of the above constituents except for pH and oil & grease
Group 4[a] **WNSO34 (S34)**	First flush grab liquid	Semiannually; 2 per year	pH, oil & grease, BOD_5, TSS, TDS, total P, Al, Fe, total recoverable Cu, Pb, Zn, surfactant (as LAS)
	Flow-weighted composite liquid	Semiannually; 2 per year	Total flow, plus all of the above constituents except for pH and oil & grease
Group 5[a] **WNSO14 (S14)** **WNSO17 (S17)** **WNSO28 (S28)**	First flush grab liquid	Semiannually; 2 per year	pH, oil & grease, BOD_5, TSS, TDS, total P, Al, Fe, total recoverable Cu, Pb, Zn, V, TKN, ammonia (as NH_3), NO_3-N, NO_2-N, surfactant (as LAS), sulfide, settleable solids, total nitrogen (as N)
	Flow-weighted composite liquid	Semiannually; 2 per year	Total flow, plus all of the above constituents except for pH and oil & grease
Group 6[a] **WNSO36 (S36)** **WNSO37 (S37)** **WNSO38 (S38)** **WNSO39 (S39)** **WNSO40 (S40)** **WNSO41 (S41)** **WNSO42 (S42)** **WNSO43 (S43)**	First flush grab liquid	Semiannually; 2 per year	pH, oil & grease, BOD_5, TSS, TDS, total P, Al, Fe, total recoverable Cu, Pb, Zn, V, TKN, ammonia (as NH_3), NO_3-N, NO_2-N, surfactant (as LAS), sulfide, settleable solids, total nitrogen (as N)
	Flow-weighted composite liquid	Semiannually; 2 per year	Total flow, plus all of the above constituents except for pH and oil & grease

[a] Required by SPDES Permit #NY0000973. Results reported in the SPDES DMR and evaluated in this ASER.

Sample Location Code	Sampling Type/ Medium	Collection Frequency/ Total Annual Samples	Measurements/Analyses
Storm Water Outfalls			
Group 7[a] **WNSO20 (S20)**	First flush grab liquid	Semiannually; 2 per year	pH, oil & grease, BOD_5, TSS, TDS, total P, Al, Fe, total recoverable Cu, Pb, Zn, TKN, ammonia (as NH_3), NO_3-N, NO_2-N, surfactant (as LAS), sulfide, total nitrogen (as N)
	Flow-weighted composite liquid	Semiannually; 2 per year	Total flow, plus all of the above constituents except for pH and oil & grease
Group 8[a] **WNSO27 (S27)** **WNSO35 (S35)**	First flush grab liquid	Semiannually; 2 per year	pH, oil & grease, BOD_5, TSS, TDS, total P, Al, Fe, total recoverable Cu, Pb, Zn, TKN, ammonia (as NH_3), NO_3-N, NO_2-N, surfactant (as LAS), total nitrogen (as N)
	Flow-weighted composite liquid	Semiannually; 2 per year	Total flow, plus all of the above constituents except for pH and oil & grease
WNSWR01[a] Site rain gauge	Field measurement of precipitation	1 each storm water event	pH
On-Site Surface Water			
WNSWAMP Northeast swamp drainage **WNSW74A** North swamp drainage	Timed continuous composite liquid	Biweekly; 26 per year	Gross alpha/beta, H-3, pH, flow (at WNSWAMP only)
	Composite of biweekly samples	Monthly; 12 per year[b]	Sr-90 and gamma isotopic
	Composite of biweekly samples	Semiannually; 2 per year	C-14, I-129, U-232, U-233/234, U-235/236, U-238, total U, Pu-238, Pu-239/240, Am-241
	Grab liquid	Semiannually; 2 per year (not sampled during wet weather conditions)	Temperature (field), pH (field), TOX, oil & grease
	24-hour timed continuous composite liquid	Semiannually; 2 per year (not sampled during wet weather conditions)	TSS, TDS, NPOC, NH_3 (as N), NO_3 (as N), NO2 (as N), bromide, fluoride, sulfate, total sulfide, surfactant (as LAS), alpha-BHC, hardness (Ca and Mg), total Al, B, Cd, Co, Cr, Cu, Fe, Hg (method 1631), Mn, Ni, Pb, Sb, Se, Ti, Tl, V, Zn, dissolved As, Cu
WNSP005 Facility yard drainage	Grab liquid	Monthly; 12 per year	Gross alpha/beta, H-3, pH
	Composite of monthly samples	Semiannually; 2 per year	Sr-90 and gamma isotopic
WNCOOLW Cooling tower basin	Grab liquid	Annually; 1 per year	Gross alpha/beta, H-3, Sr-90, gamma isotopic, pH
WNFRC67 Franks Creek east of the SDA	Grab liquid	Quarterly; 4 per year[b] (collected at same time as **WNNDADR**)	Gross alpha/beta, H-3, Sr-90, gamma isotopic, pH

[a] Required by SPDES Permit #NY0000973. Results reported in the SPDES DMR and evaluated in this ASER.
[b] Shared with NYSDOH

Sample Location Code	Sampling Type/ Medium	Collection Frequency/ Total Annual Samples	Measurements/Analyses
On-Site Surface Water			
WNERB53 Erdman Brook north of disposal areas	Grab liquid	Quarterly; 4 per year (collected at same time as **WNNDADR**)[a]	Gross alpha/beta, H-3, pH
	Composite of quarterly samples	Semiannually; 2 per year	Gross alpha/beta, H-3, Sr-90, gamma isotopic
WNNDADR Drainage between NDA and SDA	Grab liquid	Biweekly; 26 per year	H-3, pH, NPOC, TOX
	Timed continuous composite liquid	Biweekly; 26 per year	Held for composite
	Composite of biweekly samples	Monthly; 12 per year	Gross alpha/beta, gamma isotopic
	Composite of biweekly samples	Semiannually; 2 per year	Sr-90 and I-129
	Grab liquid	Quarterly; 4 per year	Gross alpha/beta, H-3
WNDCELD Drainage south of drum cell	Grab liquid	Bimonthly; 6 per year	Gross alpha/beta, H-3, pH
	Composite of bimonthly samples	Semiannually; 2 per year	H-3, Sr-90, I-129, gamma isotopic
WNNDATR NDA trench interceptor project	Grab liquid	Monthly; 12 per year	Gross alpha/beta, H-3, gamma isotopic, NPOC, TOX
	Composite of monthly samples	Semiannually; 2 per year	I-129
WNSTAW9 North reservoir near intake	Grab liquid	Annually; 1 per year	Gross alpha/beta, H-3, Sr-90, gamma isotopic, pH, conductivity, Cl, Fe, Mn, Na, NO_3+NO_2-N, SO_4
On-Site Potable (Drinking) Water			
WNDNKUR Utility room (entry point [EP-1]) potable water storage tank	Grab liquid	Monthly; 12 per year	Gross alpha/beta, H-3, pH, conductivity
	Grab liquid[b]	Annually; 1 per year	As, Ba, Be, Cd, Cr, Hg, Ni, Sb, Se, Tl, cyanide, fluoride
WNDNKMP Main plant drinking water **WNDNKEL** Environmental laboratory drinking water	Grab liquid	Annually; 1 per year from each location	Gross alpha/beta, H-3, pH, conductivity
	Grab liquid[b]	Annually; 1 per year (**WNDNKEL** only)	Total haloacetic acids, total trihalomethanes
On-Site Groundwater			
Low-level waste treatment facility: SSWMU #1 (wells 103, 104, 105, 106, 107, 108, 110, 111, 116, 8604, 8605)	Grab liquid	Quarterly during the fiscal year (generally[c]); 4 per year	Gross alpha/beta, H-3
	Direct field measurement	Twice each sampling event; 8 per year for wells sampled quarterly	Conductivity, pH

[a] Sample shared with NYSDOH

[b] A sample for NO_3 (as total nitrate) is collected by the Cattaraugus County Health Department (CCHD). Pb and Cu are sampled at this site based upon CCHD guidance.

[c] Sampling frequency and analyses vary from point to point.

Sample Location Code	*Sampling Type/ Medium*	*Collection Frequency/ Total Annual Samples*	*Measurements/Analyses*
On-Site Groundwater			
Miscellaneous small units: SSWMU #2 (wells 201, 204, 205, 206, 208) **Liquid waste treatment system:** SSWMU #3 (wells 301, 302) **High-level waste storage and processing tank:** SSWMU #4 (wells 401, 402, 403, 405, 406, 408, 409) **Maintenance shop leach field:** SSWMU #5 (wells 501, 502) **Low-level waste storage area:** SSWMU #6 (wells 602A, 604, 605, 8607, 8609) **Chemical process cell waste storage area:** SSWMU #7 (wells 704, 706, 707) **Construction and demolition debris landfill:** SSWMU #8 (wells 801, 802, 803, 804, 8603, 8612) **NRC-licensed disposal area (NDA):** SSWMU #9 (wells 901, 902, 903, 906, 908, 909, 910, 8610, 8611, trench NDATR) **IRTS drum cell:** SSWMU #10 (wells 1005, 1006, 1007, 1008B, 1008C)	Grab liquid	Quarterly during the fiscal year (generally[a]); 4 per year	Gross alpha/beta, H-3
	Direct field measurement	Twice each sampling event; 8 per year for wells sampled quarterly	Conductivity, pH
State-licensed disposal area (SDA) (SSWMU #11)	Groundwater wells in SSWMU #11 are sampled by NYSERDA under a separate program. For information, see the NYSERDA website at www.nyserda.org.		

[a] Sampling frequency and analyses vary from point to point.

Sample Location Code	*Sampling Type/ Medium*	*Collection Frequency/ Total Annual Samples*	*Measurements/Analyses*
On-Site Groundwater			
Remote-handled waste facility (not in an SSWMU): Wells 1301, 1302, 1303, 1304	Grab liquid	Quarterly during the fiscal year (generally[a]); 4 per year	Gross alpha/beta, H-3
	Direct field measurement	Twice each sampling event; 8 per year for wells sampled quarterly	Conductivity pH
North plateau seeps (not in an SSWMU): (points GSEEP, SP04, SP06, SP11, SP12)	Grab liquid	Semiannually (quarterly at GSEEP); 2 (or 4) per year	Gross alpha/beta, H-3 (also VOCs at GSEEP and SP12)
	Direct field measurement of sampled water	Semiannually at SP12 (quarterly at GSEEP); 2 (or 4) per year	pH, conductivity
Miscellaneous monitoring locations (not in an SSWMU): Well points WP-A, WP-C, WP-H, NB1S	Grab liquid	Annually (quarterly at NB1S); 1 (or 4) per year	Gross alpha/beta, H-3
	Direct field measurement of sampled water	Annually (quarterly at NB1S); 1 (or 4) per year	pH, conductivity
Surface water elevation points: (SE001 through SE011)	Direct field measurement	Quarterly; 4 per year at each location	Water level
Off-Site Surface Water			
WFBIGBR Cattaraugus Creek at Bigelow Bridge (background)	Grab liquid	Quarterly; 4 per year	Gross alpha/beta, H-3, Sr-90, gamma isotopic, pH
WFFELBR Cattaraugus Creek at Felton Bridge (downstream of confluence with Buttermilk Creek); nearest point of public access to waters receiving WVDP effluents	Timed continuous composite liquid	Weekly during lagoon 3 discharge, otherwise biweekly; 26–34 per year	Gross alpha/beta, H-3, pH, flow
	Flow-weighted composite of weekly and biweekly samples	Monthly; 12 per year[b]	Gross alpha/beta, H-3, Sr-90, and gamma isotopic
	Composite of weekly and biweekly samples	Semiannually; 2 per year	Tc-99
WFBCTCB Buttermilk Creek at Thomas Corners Road, downstream of WVDP and upstream of confluence with Cattaraugus Creek	Timed continuous composite liquid	Biweekly; 26 per year	Hold for composite
	Composite of biweekly	Monthly; 12 per year[b]	Gross alpha/beta, H-3
	Composite of biweekly samples	Semiannually; 2 per year	Sr-90, Tc-99, gamma isotopic
	Grab liquid	Monthly; 12 per year	Hardness (Ca and Mg)
	Grab liquid	Semiannually; 2 per year[c]	Temperature (field), pH (field), dissolved oxygen (field), TOX, oil & grease
	24-hour timed continuous composite	Semiannually; 2 per year[c]	TSS, TDS, NPOC, NH3 (as N), NO3 (as N), NO2 (as N), bromide, fluoride, sulfate, total sulfide, surfactant (as LAS), alpha-BHC, B, Ba, Co, Fe, Na, Mn, Sb, Ti, Tl, V, dissolved Al, As, Cd, Cr, Cu, Hg (method 1631), Ni, Pb, Se, Zn

[a] Sampling frequency and analyses vary from point to point.
[b] Sample shared with NYSDOH
[c] Samples are collected when point WNSP001 and WNSP007 are discharging.

Sample Location Code	***Sampling Type/ Medium***	***Collection Frequency/ Total Annual Samples***	***Measurements/Analyses***
Off-Site Surface Water			
WFBCBKG Buttermilk Creek near Fox Valley (background)	Timed continuous composite liquid	Weekly; 52 per year	Hold for composite
	Composite of weekly samples	Monthly; 12 per year[a]	Gross alpha/beta, H-3
	Composite of weekly samples	Quarterly; 4 per year	C-14, Sr-90, Tc-99, I-129, U-232, U-233/234, U-235/236, U-238, total U, Pu-238, Pu-239/240, Am-241, gamma isotopic
	Grab liquid	Monthly; 12 per year	Hardness (Ca and Mg)
	Grab liquid	Semiannually; 2 per year[b]	Temperature (field), pH (field), dissolved oxygen (field), TOX, oil & grease
	24-hour timed continuous composite	Semiannually; 2 per year[b]	TSS, TDS, NPOC, NH_3 (as N), NO_3 (as N), NO_2 (as N), bromide, fluoride, sulfate, total sulfide, surfactant (as LAS), alpha-BHC, B, Ba, Co, Fe, Na, Mn, Sb, Ti, Tl, V, dissolved Al, As, Cd, Cr, Cu, Hg (method 1631), Ni, Pb, Se, Zn
Off-Site Potable (Drinking) Water Wells			
WFWEL06 Background well, 29 km south of WVDP	Grab liquid	Annually; 1 per year	Gross alpha/beta, H-3, Sr-90, gamma isotopic, pH, conductivity
Near-site private wells[c] **WFWEL01** (3.0 km WNW) **WFWEL02** (1.5 km NW) **WFWEL03** (3.5 km NW) **WFWEL04** (3.0 km NW) **WFWEL05** (2.5 km SW) **WFWEL07** (4.4 km NNE) **WFWEL08** (2.5 km ENE) **WFWEL09** (3.0 km SE) **WFWEL10** (7.0 km N)	Grab liquid	Biennially; 1 every other year at each location	Gross alpha/beta, H-3, Sr-90, gamma isotopic, pH, conductivity
Fallout			
ANRGFOP Rain gauge on-site	Integrated precipitation	Monthly; 12 per year	Gross alpha/beta, H-3, gamma isotopic, volume

[a] Samples shared with NYSDOH

[b] Samples are collected when points WNSP001 and WNSP007 are discharging.

[c] Samples were last collected in 2006. No drinking water wells are located in hydrogeological units affected by site activity.

Sample Location Code	Sampling Type/ Medium	Collection Frequency/ Total Annual Samples	Measurements/Analyses
Off-Site Air			
AFFXVRD 3.0 km south-southeast at Fox Valley **AFRT240** 2.0 km northeast on Route 240 **AFSPRVL** 9.4 km north at Springville **AFWEVAL** 6.2 km south-southeast at West Valley **AFRSPRD** 1.5 km northwest on Rock Springs Road **AFGRVAL** 29 km south at Great Valley (background)	Continuous air particulate filter	Biweekly; 26 per year at each location	Gross alpha/beta, flow
	Composite of biweekly filters	Semiannually; 2 per year	Sr-90, gamma isotopic, flow At **AFRSPRD** and **AFGRVAL**, also U-232, U-233/234, U-235/236, U-238, total U, Pu-238, Pu-239/240, Am-241
	Continuous charcoal cartridge	Monthly (**AFRSPRD** and **AFGRVAL** only)	Held for composite
	Composite of monthly charcoal cartridges	Semiannually; 2 per year	I-129
Off-Site Soil			
SF off-site soil series (collected at each of 6 off-site air samplers); SFFXVRD, SFRT240, SFSPRVL, SFWEVAL, SFRSPRD, and SFGRVAL	Surface plug composite soil	Triennial; 1 each location every third year	Gross alpha/beta, Sr-90, gamma isotopic, Pu-238, Pu-239/240, Am-241. At **SFRSPRD** and **SFGRVAL**, also U-232, U-233/234, U-235/236, U-238, and total U
On-Site Soil/Sediment			
SN on-site soil series; **SNSW74A** (near WNSW74A), **SNSWAMP** (near WNSWAMP), and **SNSP006** (near WNSP006)	Surface plug composite soil/sediment	Annually; 1 per location	Gross alpha/beta, gamma isotopic, Sr-90, U-232, U-233/234, U-235/236, U-238, total U, Pu-238, Pu-239/240, Am-241, Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn
Off-Site Sediment			
SFCCSED Cattaraugus Creek at Felton Bridge **SFSDSED**[a] Cattaraugus Creek at Springville Dam **SFTCSED** Buttermilk Creek at Thomas Corners Road **SFBCSED**[a] Buttermilk Creek at Fox Valley Road (background)	Grab stream sediment	Annually; 1 per year	Gross alpha/beta, gamma isotopic, Sr-90, U-232, U-233/234, U-235/236, U-238, total U, Pu-238, Pu-239/240, Am-241

[a] Samples shared with NYSDOH

Sample Location Code	*Sampling Type/ Medium*	*Collection Frequency/ Total Annual Samples*	*Measurements/Analyses*
Off-Site Biological			
BFFCATC[a] Fish from Cattaraugus Creek downstream of its confluence with Buttermilk Creek **BFFCATD** Fish from Cattaraugus Creek downstream of the Springville Dam **BFFCTRL**[a] Control fish sample from nearby stream not affected by WVDP (7 km or more upstream of site effluent point); background	Individual collection of fish	Annually; 10 fish from each location	Gamma isotopic and Sr-90 in edible portions, % moisture
BFMWIDR Dairy farm 3.0 km southeast of WVDP	Grab milk sample	Monthly; 12 per year	Samples held for composite
	Composite of monthly samples	Quarterly; 4 per year	Sr-90, I-129, gamma isotopic
BFMCTLS Control location 22 km south (background) **BFMBLSY**[a] Dairy farm 5.5 km west-northwest **BFMSCHT** Dairy farm 4.9 km south	Grab milk sample	Annually; 1 per year	Sr-90, I-129, gamma isotopic
BFVNEAR[a] Apples, beans, and corn from locations near the WVDP **BFVCTRL**[a] Control apples, beans, and corn from locations far from the WVDP	Grab biological	Annual (at harvest); 1 per year per sample type	Gamma isotopic and Sr-90 in edible portions, % moisture, H-3 in free moisture
BFDNEAR[a] Deer in the vicinity of the WVDP **BFDCTRL**[a] Control deer 16 km or more from the WVDP	Individual collection of venison samples, usually from deer killed in collisions with vehicles	Six deer collected annually, during hunting season	Gamma isotopic and Sr-90 in edible portions of meat, % moisture, H-3 in free moisture

[a] Samples shared with NYSDOH.

Sample Location Code	*Sampling Type/ Medium*	*Collection Frequency/ Total Annual Samples*	*Measurements/Analyses*
Off-Site Direct Radiation			
DFTLD Series: Off-site environmental thermoluminescent dosimeters (TLDs): **#1 through #16**, at each of 16 compass sectors at nearest accessible perimeter point **#20:** 1,500 m northwest (downwind receptor) **#21:** 9.4 km north, Springville **#22:** 6.2 km south-southwest **#23:** 29 km south, Great Valley (background)	Integrating TLD	Quarterly; 4 per year at each location	Gamma radiation exposure
On-Site Direct Radiation			
DNTLD Series: On-site TLDs **#19, #33**: Corners of the SDA **#24, #26–30**: Security fence around the WVDP **#35, #36, #38–40**: Near operational areas on-site **#25**: 500 m north-northwest of the plant, Rock Springs Road **#43**: SDA west perimeter fence	Integrating TLD	Quarterly; 4 per year at each location	Gamma radiation exposure

Summary of Monitoring Program Changes in 2007

Location Code	Description of Changes
WNDNKMS	The drinking water monitoring point at the maintenance shop was dropped from the program prior to demolition of the facility in April 2007.
WNS043	A new storm water monitoring location at the firing range was added to storm water group 6.
WNURRAW	Sampling for TOC and alkalinity was reduced from monthly to quarterly. The schedule is driven by the Cattaraugus County Department of Health.

The monitoring program for calendar year 2007, as presented in this Appendix, was completely reviewed at the end of the year. Modifications were made to reflect current site conditions and activities and to make the program more efficient.

Each sampling location was evaluated on several bases: (1) regulatory requirements or other drivers, (2) pathways and hazard conditions, (3) a statistical evaluation of up to 16 years of monitoring data, and (4) a determination of the need for each constituent. As a result, sampling at several locations was discontinued altogether, frequency of sampling at other locations was cut back, and the number of constituents monitored at some locations was reduced.

The revised program was put into place at the beginning of 2008. A complete listing of changes at each monitoring location is presented below. Maps in Appendix A have been revised to show those locations at which the program remained the same as that in 2007, those locations at which sampling was reduced, and those locations at which sampling has been discontinued.

Summary of Monitoring Program Changes in 2008

Location Code	Description of Changes
ANLAGAM	Continuous sampling of on-site ambient air at this location was discontinued. (Assume special ambient air sampling during activities with potential for radiological releases to air [e.g., demolition, soil excavation].)
WNSP01B	Weekly monitoring of flow has been discontinued, monthly elapsed flow time retained. Required information is obtained without weekly measurement.
WNSP007	Frequency of gross alpha/beta and tritium sampling was decreased from twice a month to monthly. Compositing frequency for gamma isotopic and strontium-90 analysis was decreased from semiannual to annual.
WNSP006 **WNSWAMP** **WNSW74A**	Sampling for all nonradiological constituents was discontinued (except for TDS at WNSP006, as discussed above). Sufficient historical data are available to characterize.
WNSP005	Sampling frequency was decreased from monthly to quarterly. (The semiannual composite for gamma isotopic and strontium-90 was retained.) The location is well characterized by historical sampling, and the flow is ultimately captured at WNSP006.

Summary of Monitoring Program Changes in 2008 *(continued)*

Location Code	Description of Changes
WNCOOLW	Water sampling at the cooling tower has been dropped from monitoring program. (The point continues to be monitored for process control.)
WNFRC67	Frequency of composites for strontium-90 and gamma isotopic analysis has been decreased from quarterly to semiannual. The location is well characterized by historical sampling and flow is ultimately captured at WNSP006.
WNERB53	Analysis of semiannual composites for gross alpha/beta and tritium has been discontinued. (These analyses are already performed on quarterly samples and need not be repeated.)
WNNDADR	Biweekly grab sampling for pH, tritium, NPOC, and TOX and quarterly grab sampling for gross alpha/beta and tritium have been discontinued. Biweekly sampling of timed continuous composites and monthly analysis of composites for gross alpha/beta, tritium, and gamma isotopic have been retained. This location is well characterized by historical sampling and flow is ultimately captured at WNSP006.
WNDCELD	Sampling at the drum cell drainage point has been discontinued. (Drums of radioactive waste have been removed from the drum cell and off-site shipment was completed in 2007.) The location is well characterized by historical sampling, and flow is ultimately captured at both WNFRC67 and WNSP006.
WNNDATR	For program efficiency, this location will be monitored only under the groundwater monitoring program. Separate sampling under the environmental monitoring program has been discontinued.
WNSTAW9	Sampling was discontinued at the last remaining standing water location near the on-site lakes that provide site utility and drinking water. No contamination above background has been noted over its historical sampling period.
WNDNKMP **WNDNKEL** **WNDNKUR**	Sampling of on-site drinking water for radiological constituents and for all chemical constituents not required by Cattaraugus County has been discontinued. Sufficient historical data are available to characterize for non-regulatory constituents. (Sampling for radiological constituents will be continued in the MPPB at point WNDNKMP.)
WFBCBKG	Frequency of sampling at the Buttermilk Creek background location for gross alpha/beta and tritium has been reduced from weekly to biweekly for consistency with the sampling schedule at other locations. Frequency of composites for radionuclides has been reduced from quarterly to semiannual. All sampling for nonradiological constituents has been discontinued.
WFBIGBR	Sampling at Cattaraugus Creek background location has been discontinued. Sufficient historical data are available to characterize. (Sampling at Buttermilk Creek background has been retained.)
WFBCTCB **WFFELBR**	Semiannual composites for analysis of technetium-99 have been discontinued. Four years of data have shown no technetium-99 contamination downstream of site.

Summary of Monitoring Program Changes in 2008 *(continued)*

Location Code	Description of Changes
WFWEL01 through WFWEL10	Sampling has been discontinued at near-site and background drinking water sources. Wells are not in aquifers affected by the site. Monitoring results from more than 15 years of sampling have shown no contamination from the WVDP.
AFFXVRD AFRT240 AFRSPRD	Sample collection at near-site ambient air sampling points has been discontinued. Ambient air samples are not required to demonstrate NESHAP compliance. (NESHAP compliance at the WVDP is demonstrated on the basis of emission measurement and modeling.) It is planned that sampling of ambient air will be resumed once EPA approval is received to use an ambient air monitoring network to demonstrate NESHAP compliance. (It is assumed that special ambient air sampling will continue to be done on-site during activities with potential for radiological releases to air [e.g., demolition, soil excavation].)
AFSPRVL AFWEVAL	Ambient air samplers in the nearby communities of Springville and West Valley were removed in early 2008. Historical data from more than 17 years of monitoring are indistinguishable from data at the background location, indicating no effect from the WVDP.
ANRGFOP	Monthly sampling of precipitation for radiological constituents has been discontinued. Sufficient historical data are available to characterize.
SFFXVRD SFRT240 SFRSPRD SFGRVAL	The sampling frequency of off-site soils has been decreased from once every three years to once every five years, consistent with guidance on periodic confirmatory sampling in DOE/EH-0173T.
SFSPRVL SFWEVAL	Sampling of off-site soils in the nearby communities of Springville and West Valley has been discontinued. The soils have been collected at the community air samplers, which have been deleted from the monitoring program. Historical data have shown no contamination.
SFCCSED SFSDSED SFTCSED SFBCSED SNSW74A SNSWAMP SNSP006	Sampling frequency for radiological constituents in sediments has been reduced from annual to once every five years, consistent with guidance on periodic confirmatory sampling in DOE/EH-0173T.
SNSW74A SNSWAMP SNSP006	Sampling for chemical constituents in on-site soils/sediments has been discontinued. Fifteen years of historical monitoring data are available for chemical characterization.
WNW0107 WNW0403 WNW0704	Discontinue annual analysis for volatile organic compounds (VOCs). None have been detected in several years of monitoring and no new sources have been identified.
WNW0108	Discontinue annual analysis of VOCs. None have been detected in several years of monitoring and no new sources have been identified. Reduce sampling frequency for radiological indicators from four to two times per year. No radiological contamination of the unweathered Lavery till (ULT) at well 108 has been observed to date, nor is expected.

Summary of Monitoring Program Changes in 2008 *(continued)*

Location Code	Description of Changes
WNW0405	Discontinue quarterly analysis for VOCs, semivolatile organic compounds (SVOCs), and radioisotopes. No VOCs or SVOCs have been detected in recent years and no new sources have been identified. Radiological indicator parameters will continue to be monitored downgradient of the waste tank farm (WTF).
WNW0706	Discontinue quarterly analysis for VOCs, SVOCs, and radioisotopes. Sampling and analyses was increased in this area to provide a pre-construction baseline for the remote-handled waste facility (RHWF). This baseline has now been established. No organics have been detected in this area. Potential radiological contamination (downgradient of active RHWF) will be monitored by radiological indicators.
WNW0111 **WNW8605**	Discontinue annual Sr-90 analysis but continue to sample for gross beta. Sr-90 is approximately equal to 50% of the gross beta result.
WNW0116	Discontinue annual Sr-90 analysis but continue to sample for gross beta. Sr-90 is about 50% of the gross beta result. Reduce analysis of indicator parameters from four to two times per year. Semiannual sampling will provide adequate coverage.
WNW0801	Reduce Sr-90 analysis from four times to once per year. The Sr-90/gross beta relationship in this area has been established. The well is sampled quarterly for radiological indicators, including gross beta.
WNW0707	Reduce analysis of indicators from four to two times per year. Semiannual sampling will provide adequate coverage.
WNW0201 **WNW0208**	Discontinue sampling. SWMUs in this area designated for No Further Action (NFA) in the RCRA Current Conditions report and subsequent NYSDEC correspondence. Wells are not monitored pursuant to the 3008(h) Order. Only DOE approval is needed.
WNW0602A	Reduce sampling frequency for radiological indicators from four to two times per year. The lag storage areas are designated NFA and are scheduled for removal in the next four years. Retain sampling to define the western edge of the plume.
WNW0604	Reduce sampling for radiological indicators from four to two times per year. The lag storage areas are designated NFA. However, sampling at this location is used to monitor potential contamination downgradient of the WTF.
WNW1007	Discontinue semiannual sampling at this well on the south plateau near the drum cell. The drum cell has been emptied.
WNW1008B **WNW1008C**	Reduce sampling for radiological indicators from two times per year to annually. Concentrations at these background locations are well characterized.
WNW1301	Discontinue quarterly sampling for VOCs, SVOCs, radioisotopes, and metals. Reduce sampling frequency for radiological indicators to once per year. No organics or radionuclides have been detected in this upgradient well and none are anticipated as a result of size-reduction operations in the RHWF. Baseline concentrations for metals have been established insofar as possible (well 1301 is often dry).

Summary of Monitoring Program Changes in 2008 *(continued)*

Location Code	Description of Changes
WNW1302	Discontinue quarterly sampling for VOCs, SVOCs, and radioisotopes. Reduce sampling frequency for radiological indicators and metals to once per year. No organics or radionuclides have been detected in this upgradient well and none are anticipated as a result of size-reduction operations in the RHWF. Baseline concentrations for metals have been established.
WNW1303	Discontinue quarterly sampling for VOCs, SVOCs, and radioisotopes. No organics or radionuclides have been detected in this area and none are anticipated because this well monitors the ULT.
WMW1304	Discontinue quarterly sampling for VOCs and SVOCs. Reduce sampling for radioisotopes to once per year. No organics have been detected in this area and none are anticipated. Continue monitoring dowgradient of the RHWF for radioisotopes.
WNW8603	Discontinue annual Sr-90 analysis but continue to sample for gross beta. Sr-90 is about 50% of the gross beta result. Reduce sampling for dinciators from four to two times per year. Semiannual sampling will provide adequate coverage.
WNW8609	Reduce Sr-90 analysis from twice to once per year. The Sr-90/gross beta relationship in this area has been established.
WNWNB1S	Discontinue sampling. Well NB1S was originally drilled as a background location for the sand and gravel (S&G) unit, but encountered only a very thin S&G interval. During the RFI new background locations were established, so NB1S is no longer used for this purpose.
SE001 through **SE006** **SE010**	Discontinue water level measurements at select locations where the general pattern has been established.
BFFCATC (fish) **BFFCATD (fish)** **BFFCTRL (fish)** **BFMCTLS (milk)** **BFMBLSY (milk)** **BFMSCHT (milk)** **BFVNEAAF (apples)** **BFVCTRA (apples)** **BFVNEAB (beans)** **BFVCTRB (beans)** **BFVNEAC (corn)** **BFVCTRC (corn)**	Frequency of sampling of most off-site biological matrices (foodstuffs) has been decreased from annual to once every five years, consistent with guidance on periodic confirmatory sampling in DOE/EH-0173T.
BFMWIDR (milk)	This one milk sampling point (of four) has been retained for annual confirmation of low dose potential from the site. Sampling frequency has been reduced from monthly to annual.
BFVNEAA (apples)	Sampling of on-site apples has been discontinued. Sufficient historical data are available to characterize, and the apples are not available to the public for consumption.

Summary of Monitoring Program Changes in 2008 *(concluded)*

Location Code	Description of Changes
WNSP006 (water) **WNSWAMP (water)** **WNFRC67 (water)** **WNERB53 (water)** **WFBCTCB (water)** **WFBCBKG (water)** **WFFELBR (water)** **AFRT240 (air)** **SFSDSED (sediments)** **SFBCSED (sediments)** **BFFCATC (fish)** **BFFCTRL (fish)** **BFMBLSY (milk)** **BFVNEAAF (apples)** **BFVCTRA (apples)** **BFVNEAB (beans)** **BFVCTRB (beans)** **BFVNEAC (corn)** **BFVCTRC (corn)** **BFDNEAR (venison)** **BFDCTRL (venison)**	Sample sharing with the New York State Department of Health (NYSDOH), performed as a courtesy, has been discontinued as a cost savings.
DFTLD01 **through** **DFTLD16** **DFTLD20**	Frequency of sampling for perimeter thermoluminescent dosimeters (TLDs) has been reduced from quarterly to semiannually. Results at perimeter TLDs over more than two decades of monitoring have been statistically indistinguishable from results from background TLD measurements.
DFTLD21 **DFTLD22**	TLDs at the community air sampling locations in Springville and West Valley have been discontinued. (Off-site exposure is measured by TLDs around site perimeter.)
DFTLD23	The frequency of background TLD measurements at Great Valley has been reduced from quarterly to semiannual to maintain the background on the same frequency as the other TLDs.
DNTLD19 **DNTLD25** **DNTLD26** **DNTLD27** **DNTLD29** **DNTLD30** **DNTLD39**	On-site TLDs at specific locations have been discontinued due to reduction and/or redistribution of radioactive sources on site.
DNTLD24 **DNTLD28** **DNTLD33** **DNTLD35** **DNTLD36** **DNTLD38** **DNTLD40** **DNTLD43**	The frequency of measurements at remaining on-site TLDs has been reduced from quarterly to semiannual.

FIGURE A-1
West Valley Demonstration Project Base Map

J:/GIS/ArcMap/ASER/ASER_2007/ASER_2007_FigA01.mxd,r.0 4/1/2008 JRL

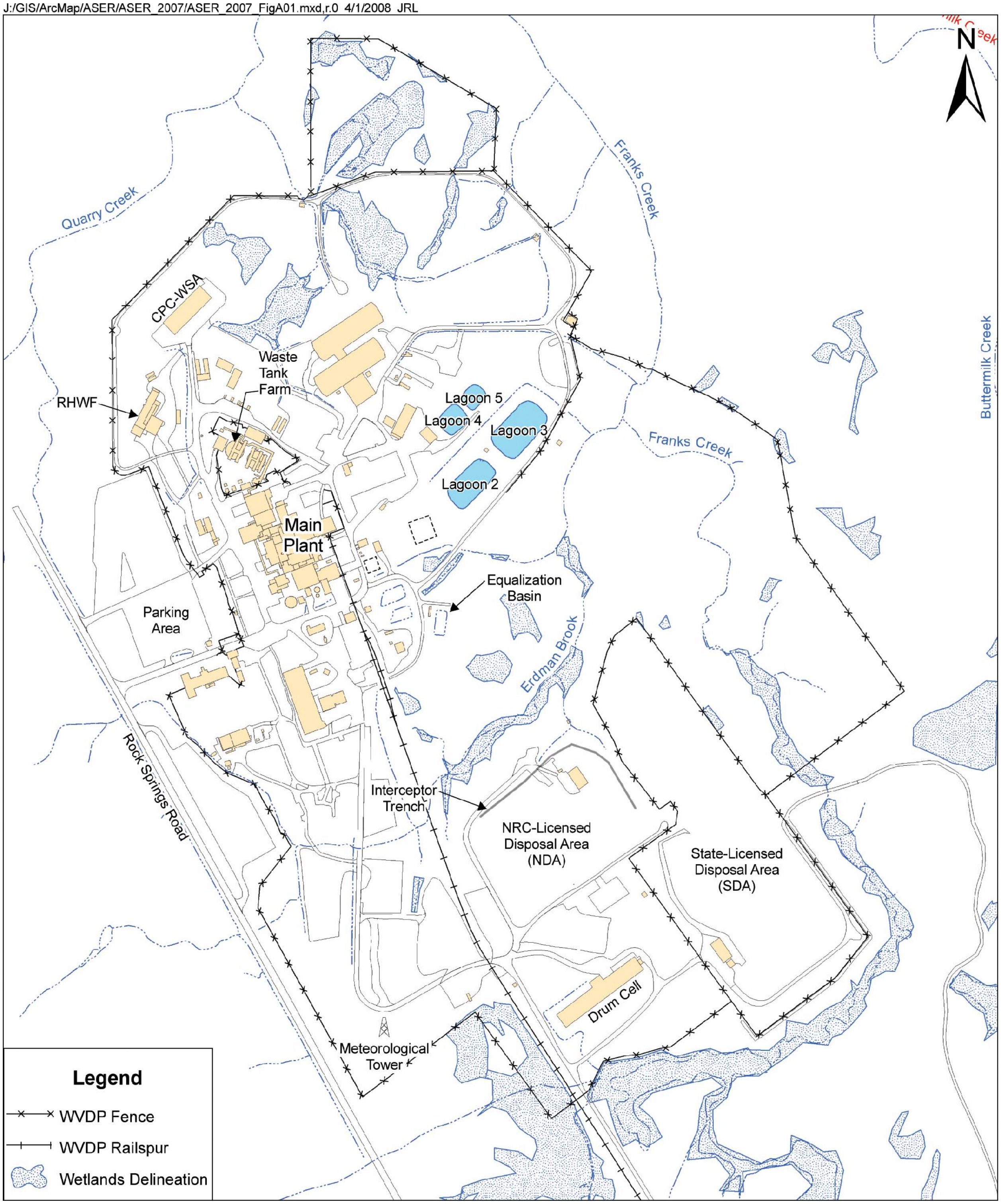
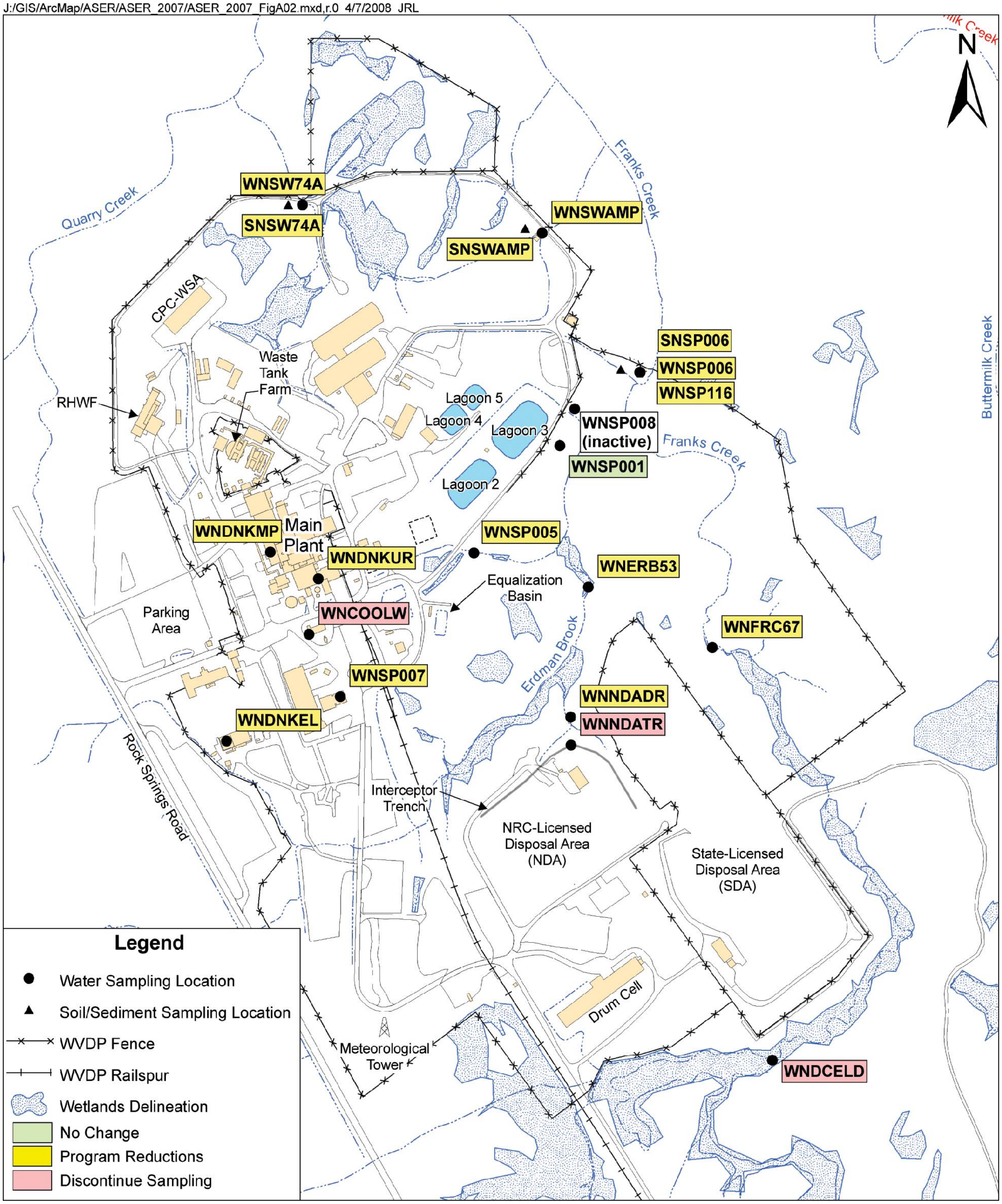


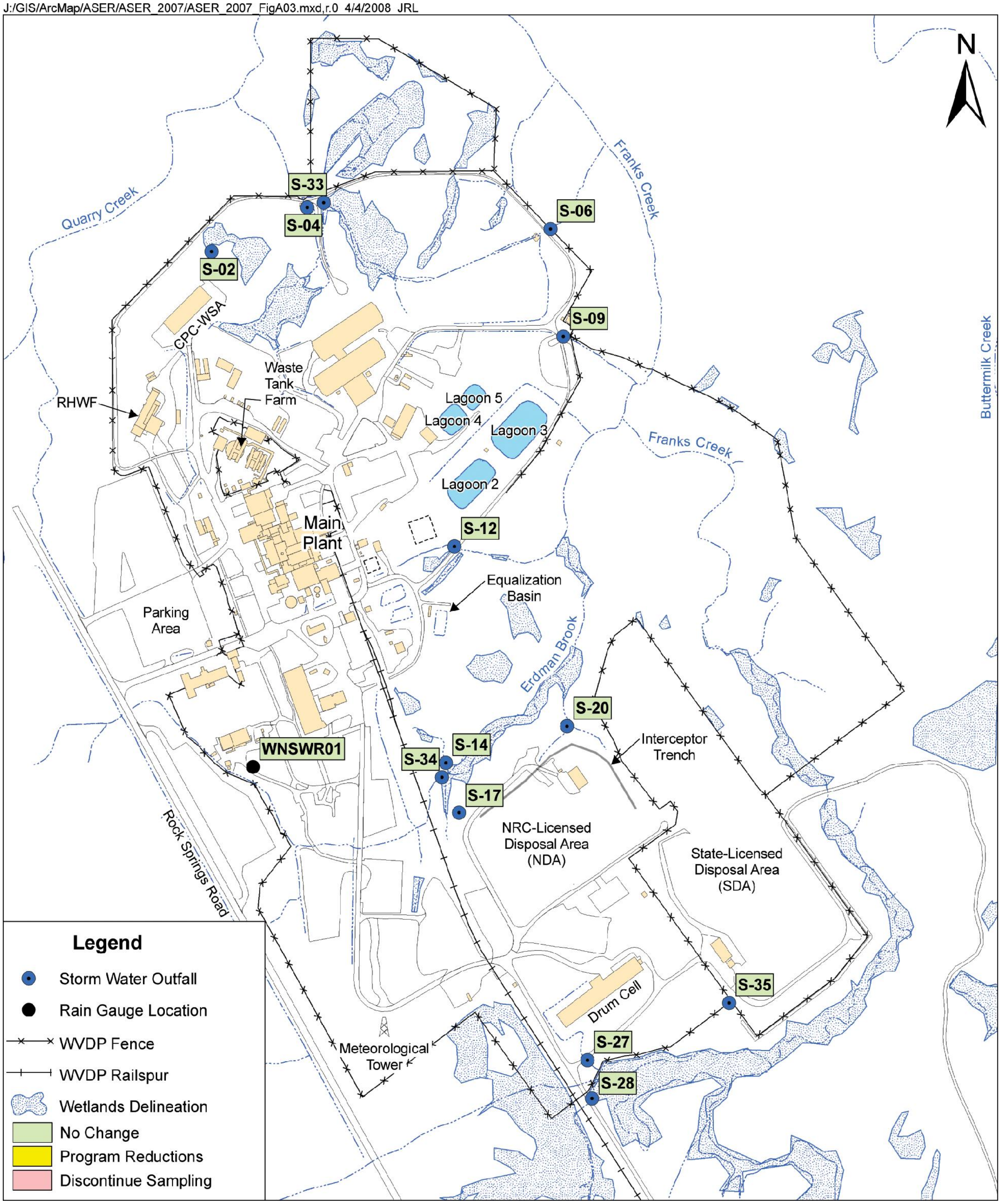
FIGURE A-2
On-Site Surface Water and Soil/Sediment Sampling Locations

J:/GIS/ArcMap/ASER/ASER_2007/ASER_2007_FigA02.mxd,r.0 4/7/2008 JRL



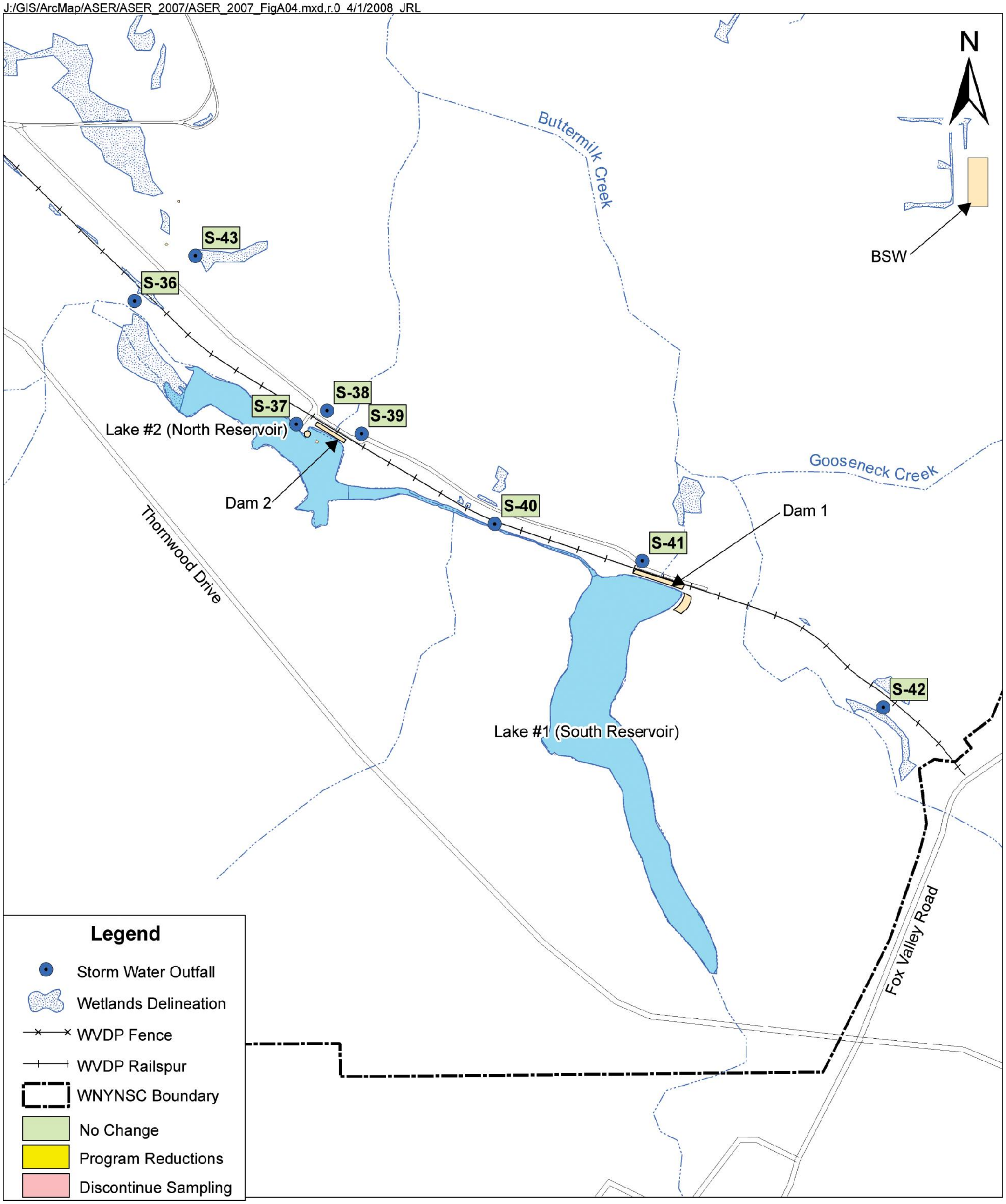
Program changes indicated in color are for CY 2008 (see pages A-19–A-24).

FIGURE A-3
On-Site Storm Water Outfalls



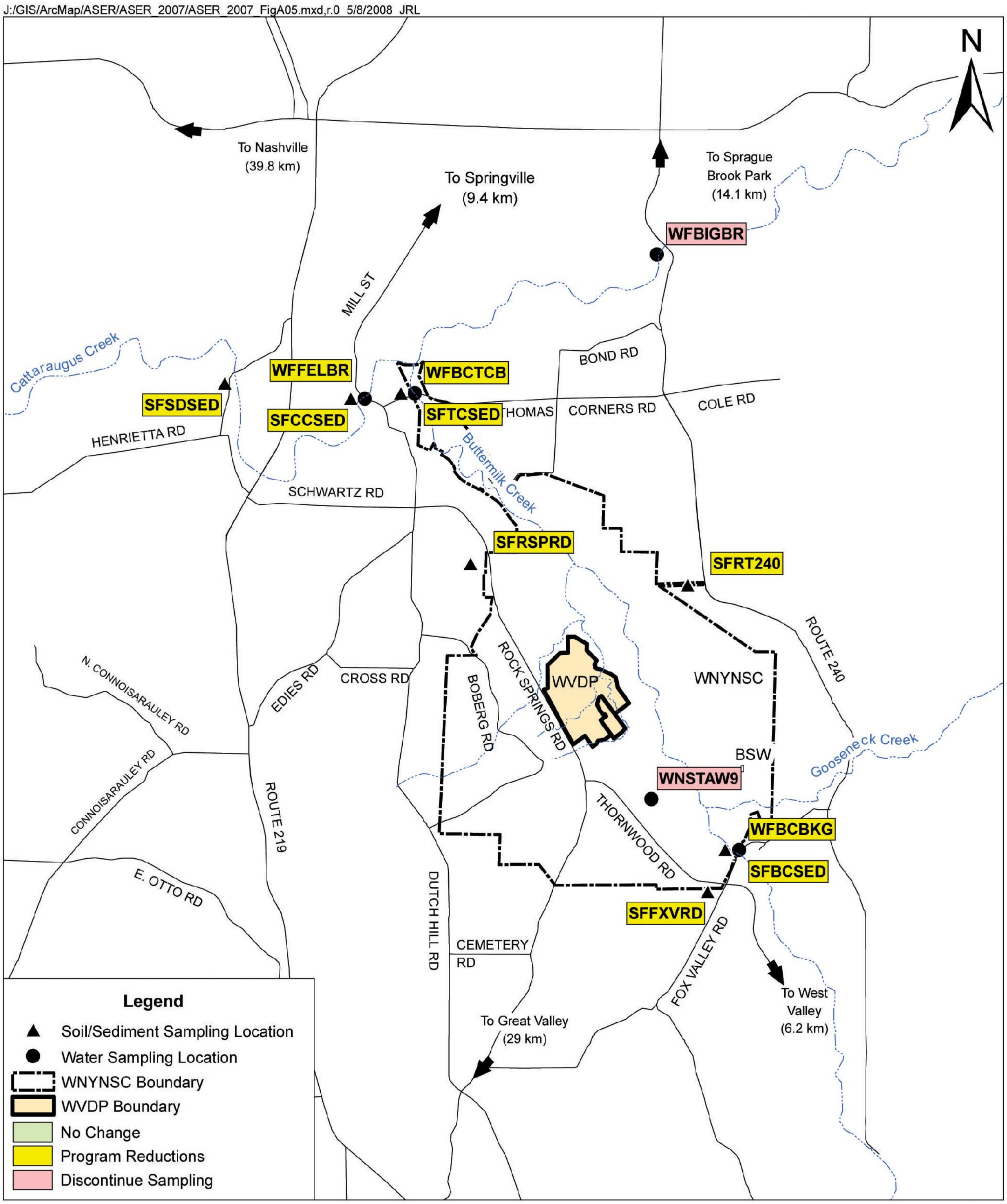
Program changes indicated in color are for CY 2008 (see pages A-19–A-24).

FIGURE A-4
Rail Spur Storm Water Outfalls



Program changes indicated in color are for CY 2008 (see pages A-19–A-24).

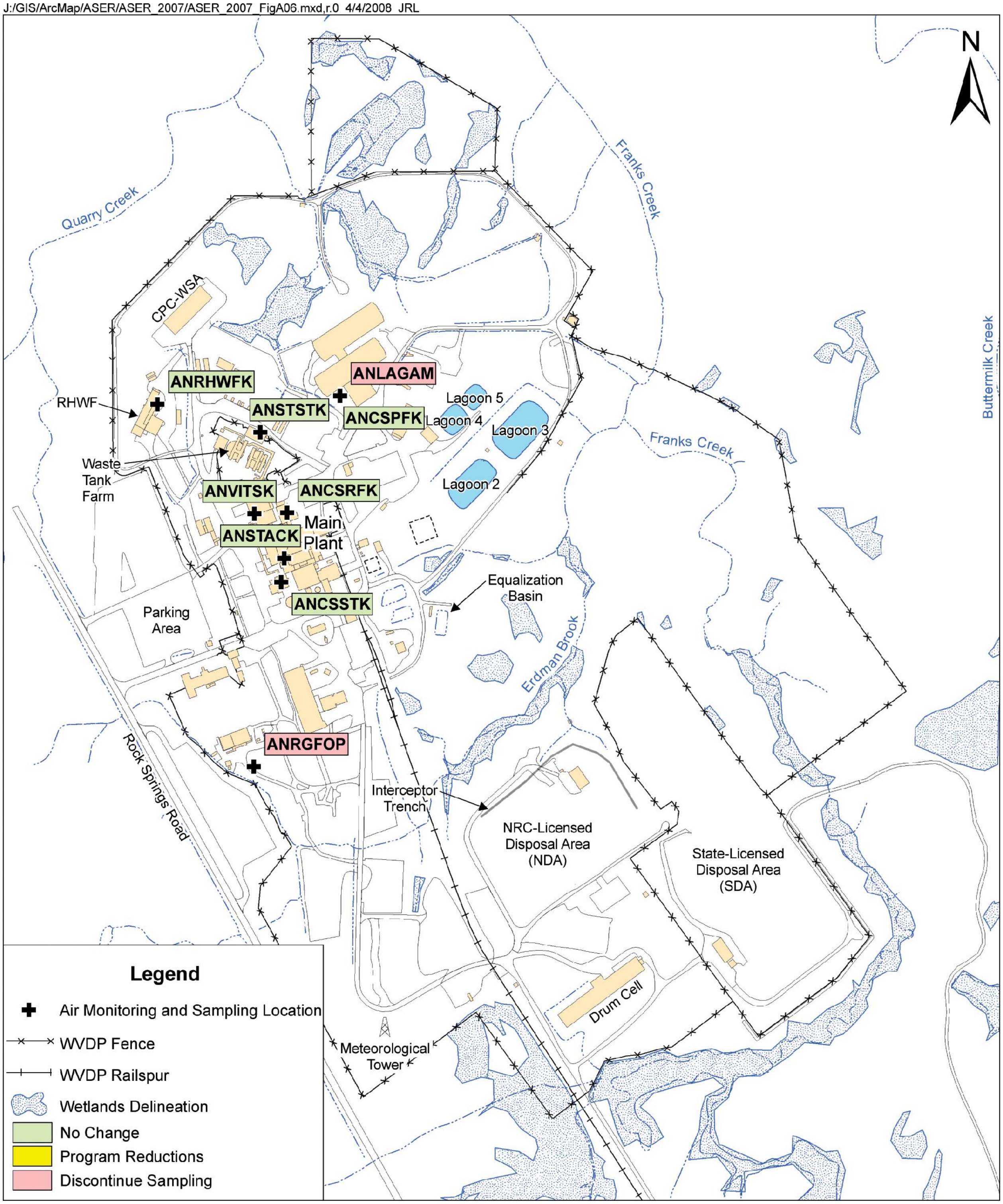
FIGURE A-5
Off-Site Surface Water and Soil/Sediment Sampling Locations



Program changes indicated in color are for CY 2008 (see pages A-19–A-24).

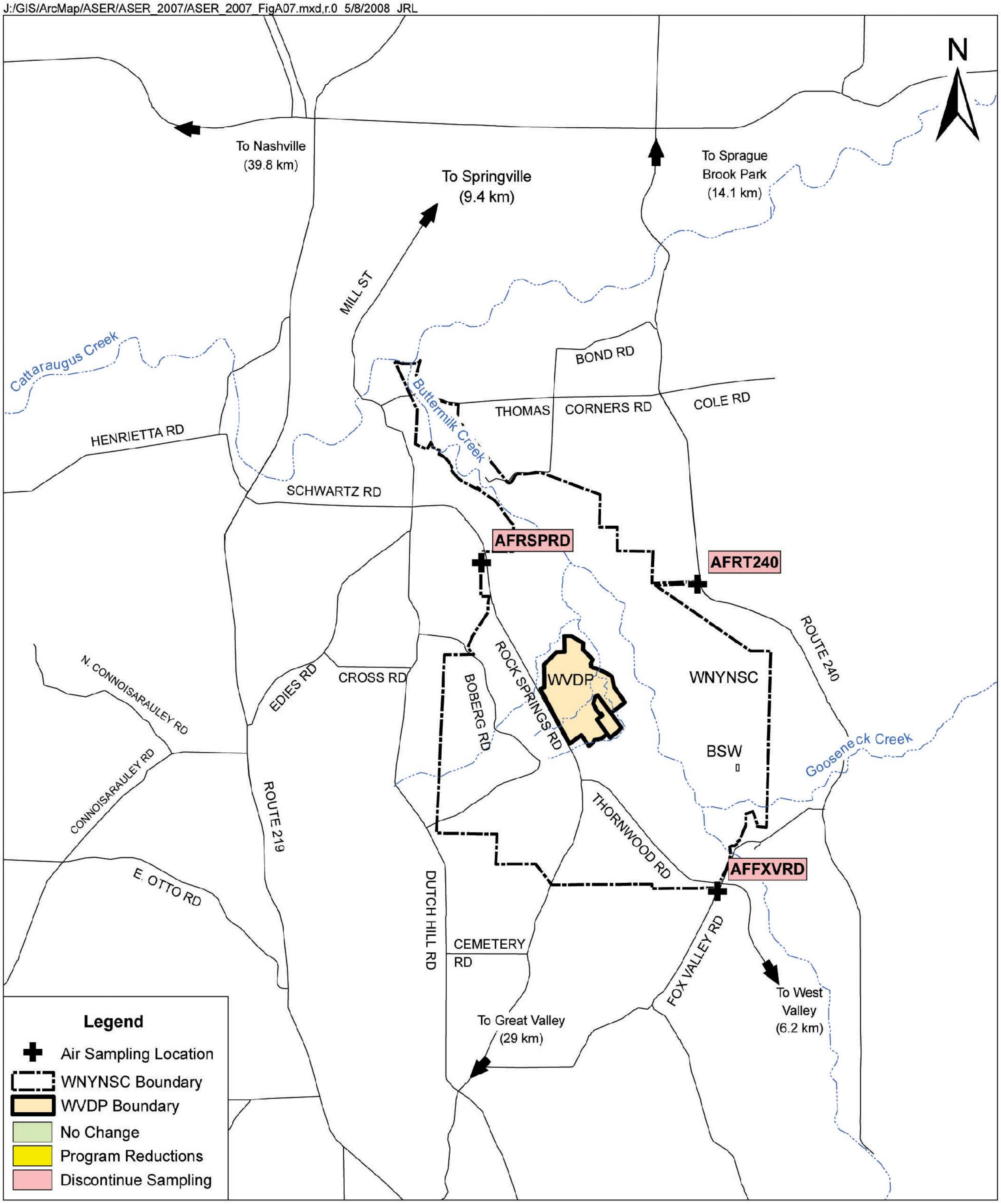
FIGURE A-6
On-Site Air Monitoring and Sampling Locations

J:/GIS/ArcMap/ASER/ASER_2007/ASER_2007_FigA06.mxd,r.0 4/4/2008 JRL



Program changes indicated in color are for CY 2008 (see pages A-19–A-24).

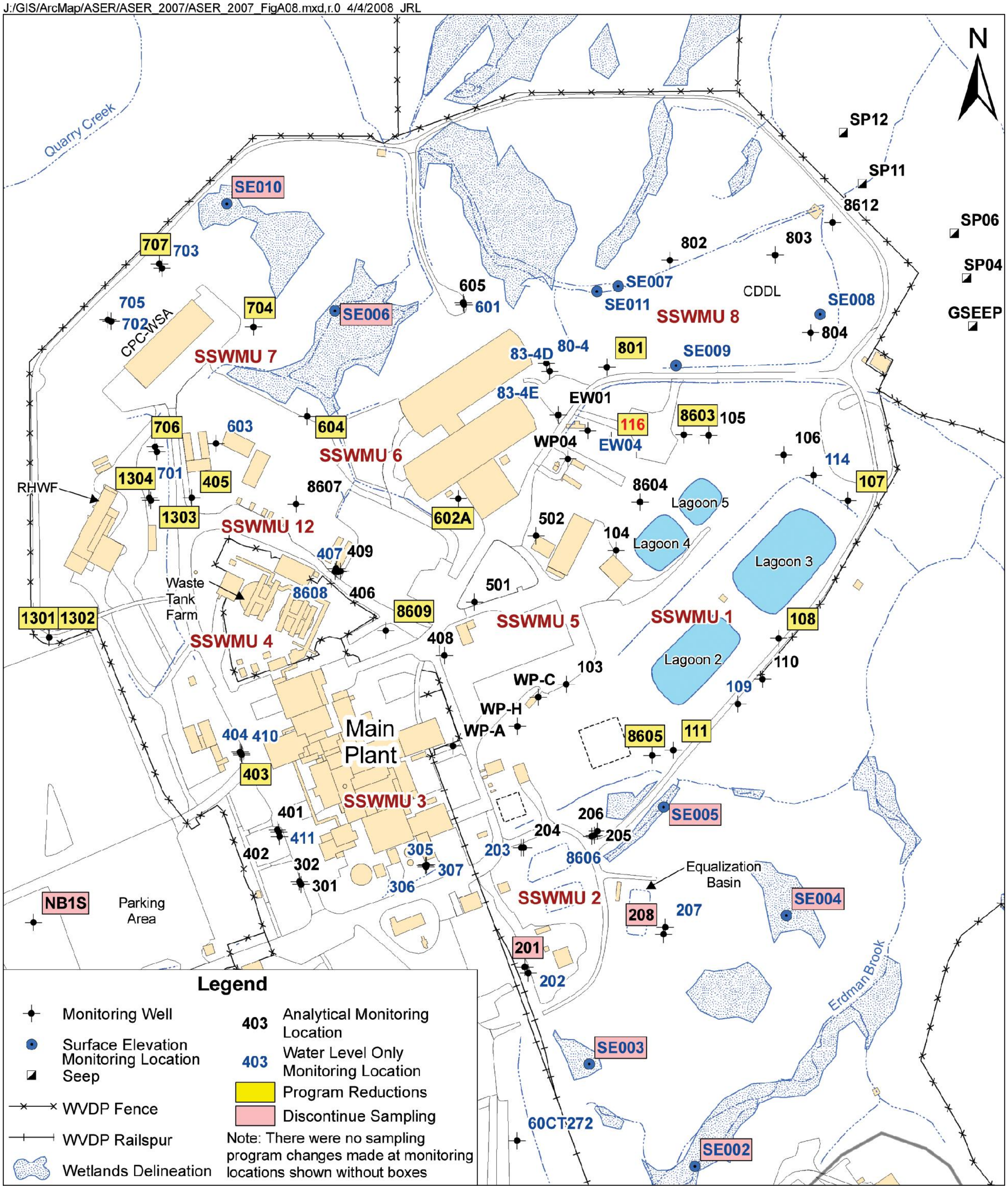
FIGURE A-7
Off-Site Air Sampling Locations



Program changes indicated in color are for CY 2008 (see pages A-19–A-24).

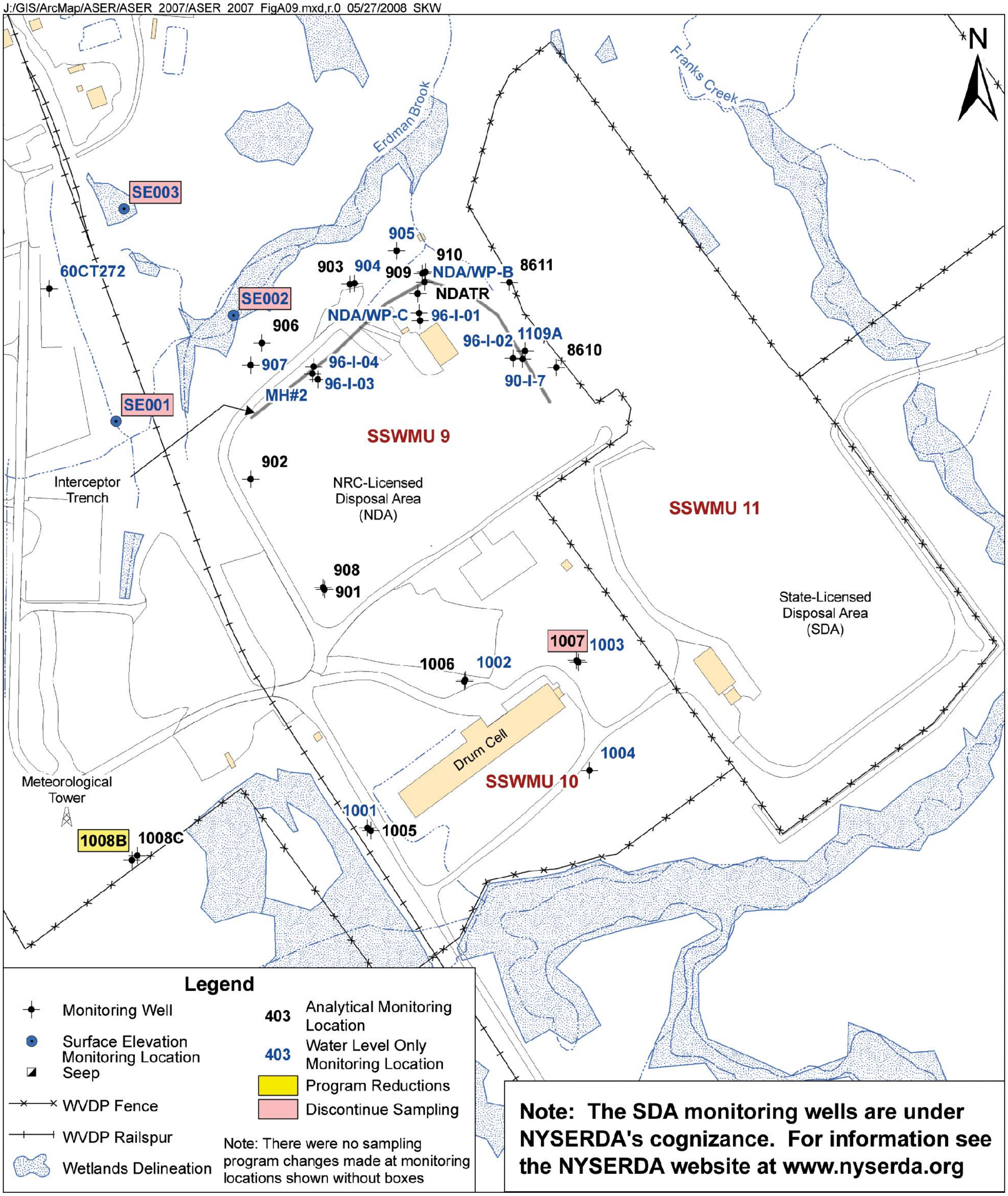
FIGURE A-8
North Plateau Groundwater Monitoring Network
(Includes Wells Used for Water-Level Measurements)

J:/GIS/ArcMap/ASER/ASER_2007/ASER_2007_FigA08.mxd,r.0 4/4/2008 JRL



Program changes indicated in color are for CY 2008 (see pages A-19–A-24).

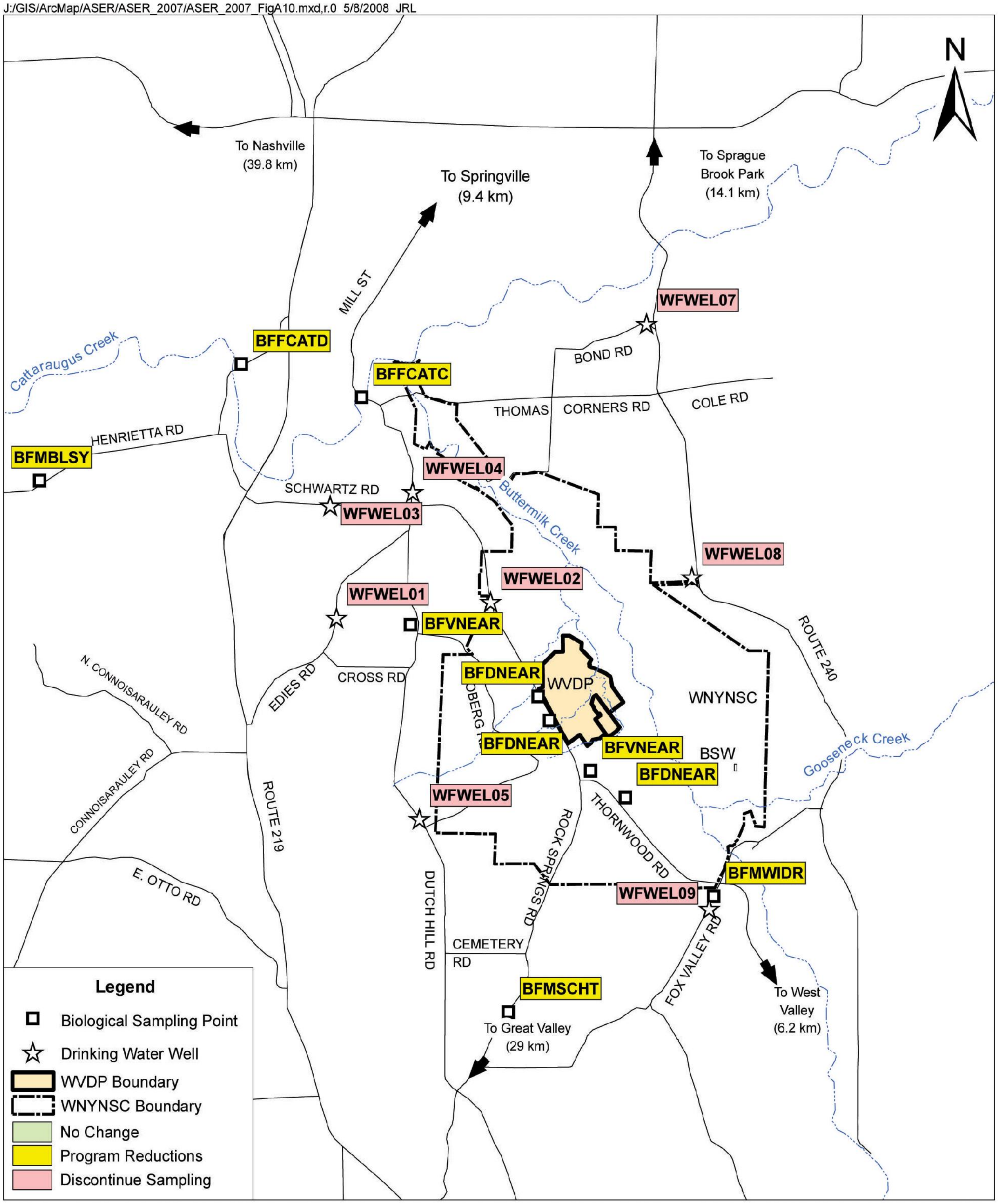
FIGURE A-9
South Plateau Groundwater Monitoring Network
(Includes Wells Used for Water-Level Measurements)



Program changes indicated in color are for CY 2008 (see pages A-19–A-24).

FIGURE A-10
Near-Site Drinking Water and Biological Sampling Locations

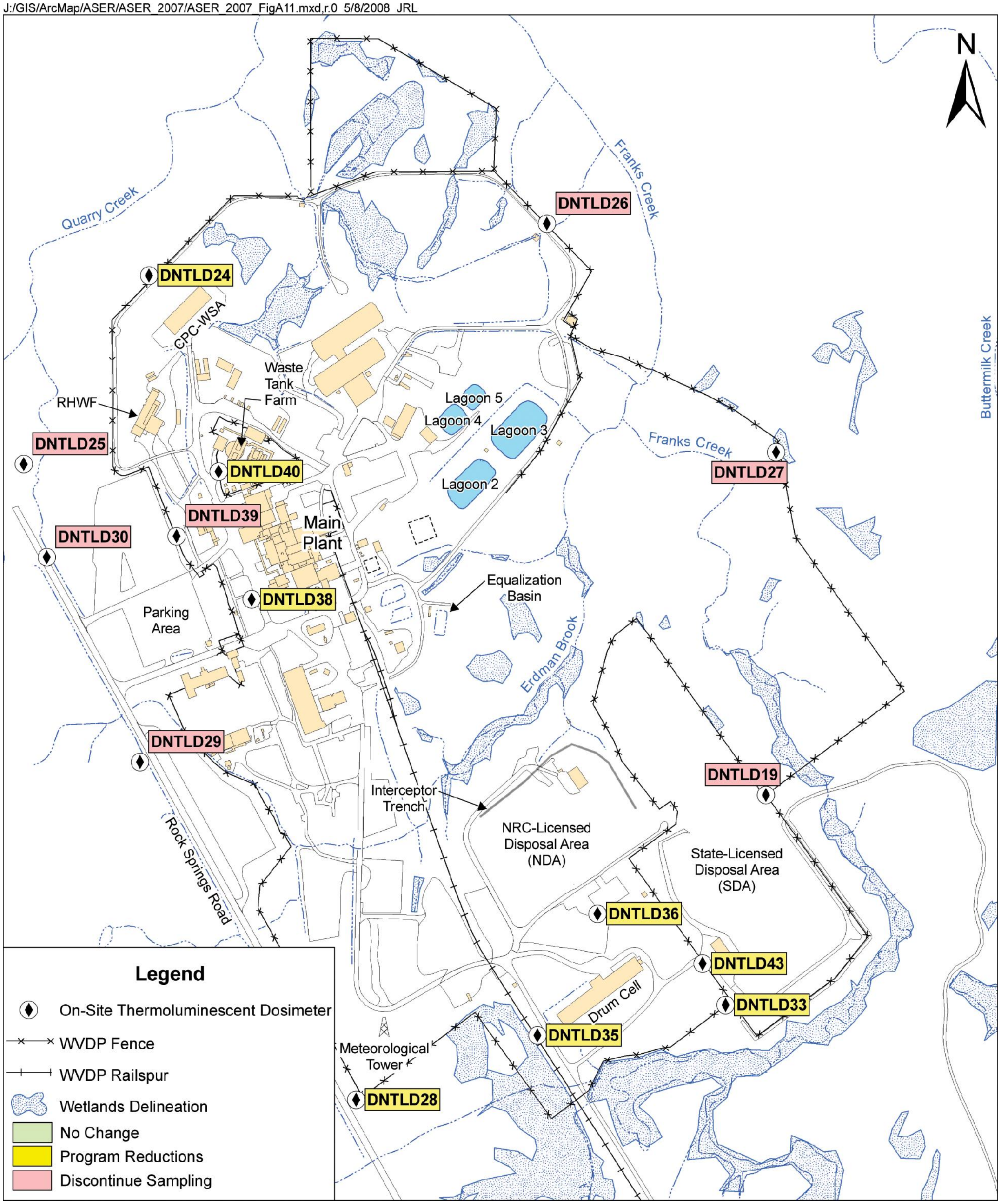
J:/GIS/ArcMap/ASER/ASER_2007/ASER_2007_FigA10.mxd,r.0 5/8/2008 JRL



Program changes indicated in color are for CY 2008 (see pages A-19–A-24A-19–A-24).

FIGURE A-11
Location of On-Site Thermoluminescent Dosimeters (TLDs)

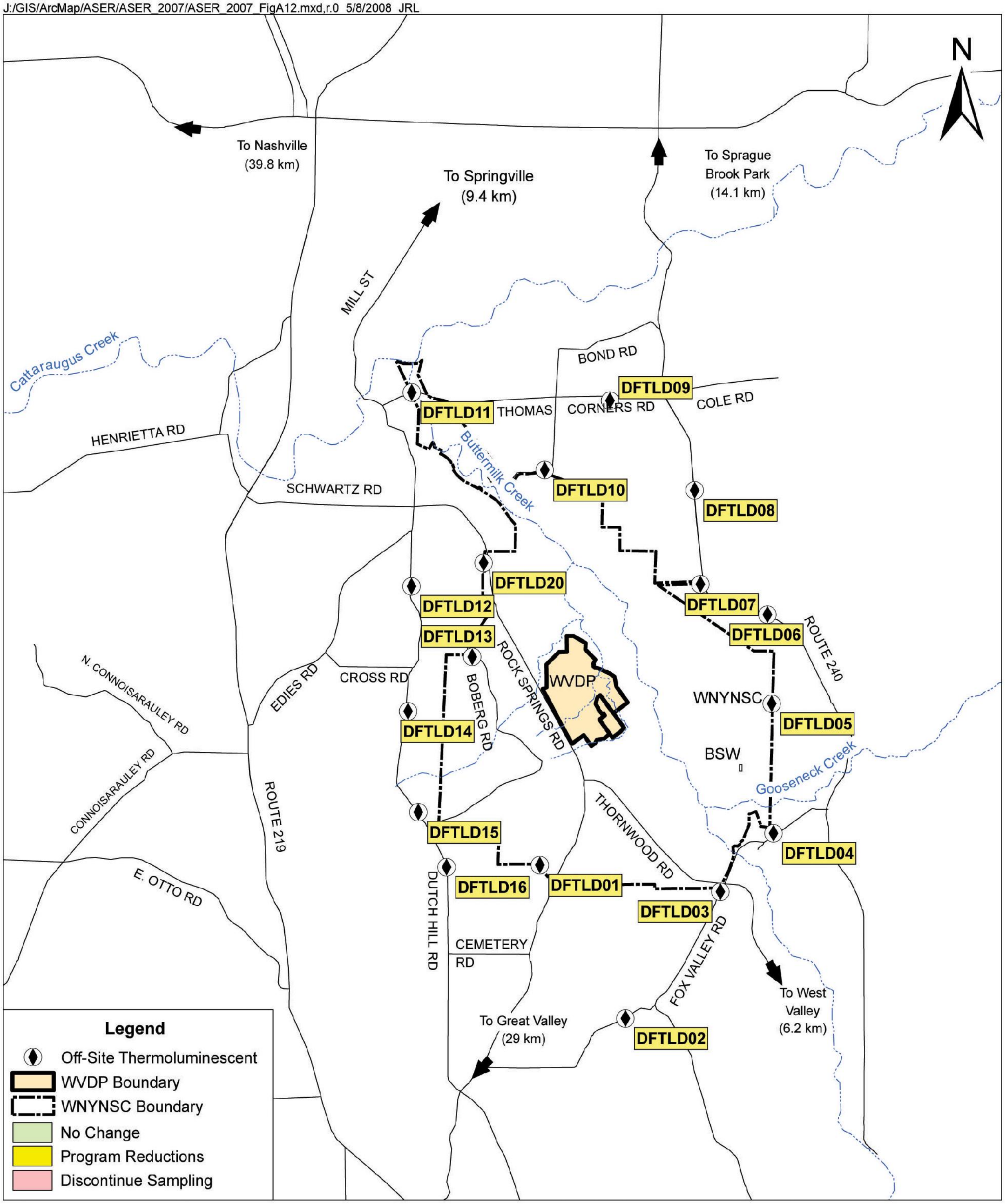
J:/GIS/ArcMap/ASER/ASER_2007/ASER_2007_FigA11.mxd,r.0 5/8/2008 JRL



Program changes indicated in color are for CY 2008 (see pages A-19–A-24).

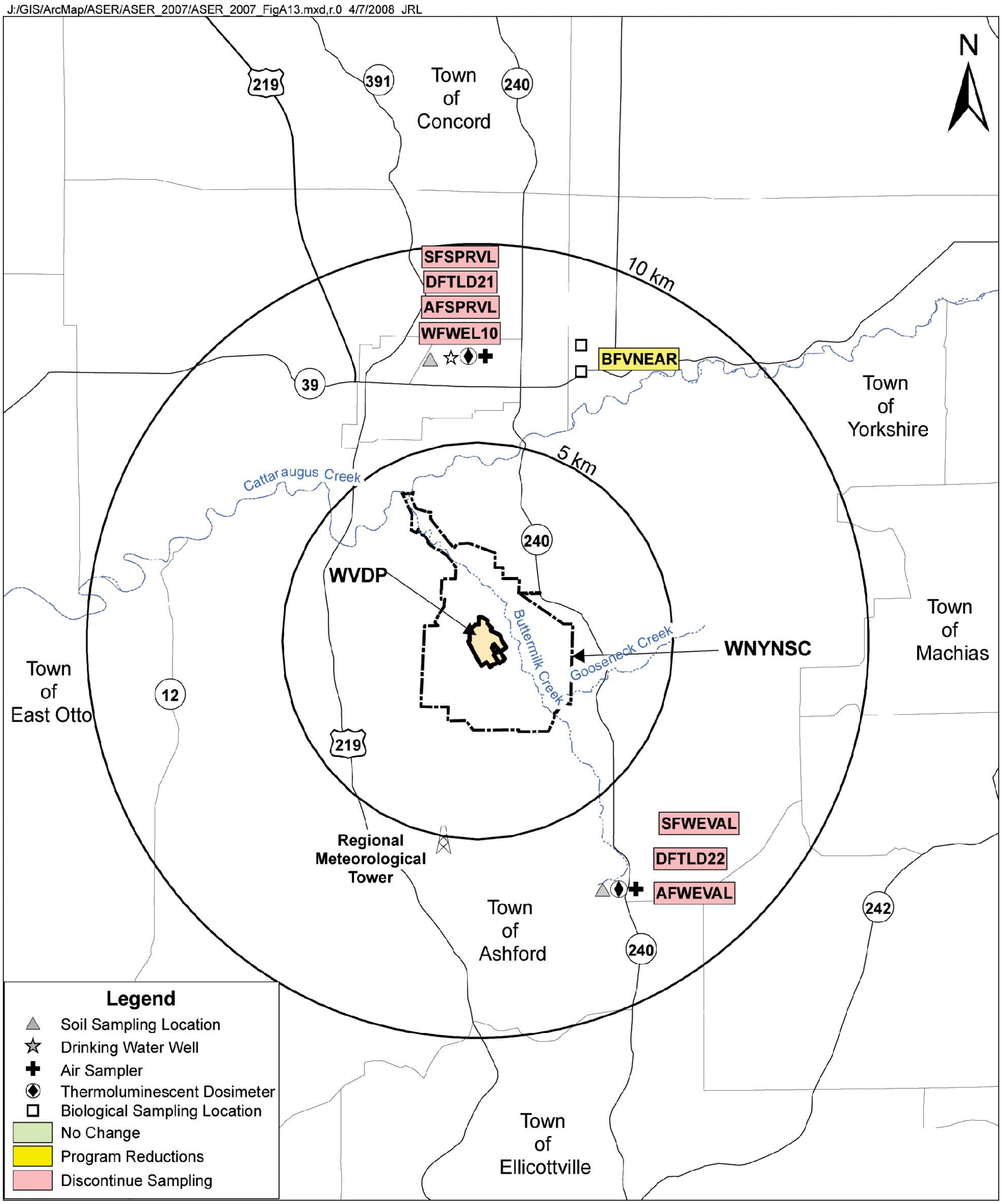
FIGURE A-12
Location of Off-Site Thermoluminescent Dosimeters (TLDs) Within 5 Kilometers of the WVDP

J:/GIS/ArcMap/ASER/ASER_2007/ASER_2007_FigA12.mxd,r.0 5/8/2008 JRL



Program changes indicated in color are for CY 2008 (see pages A-19–A-24).

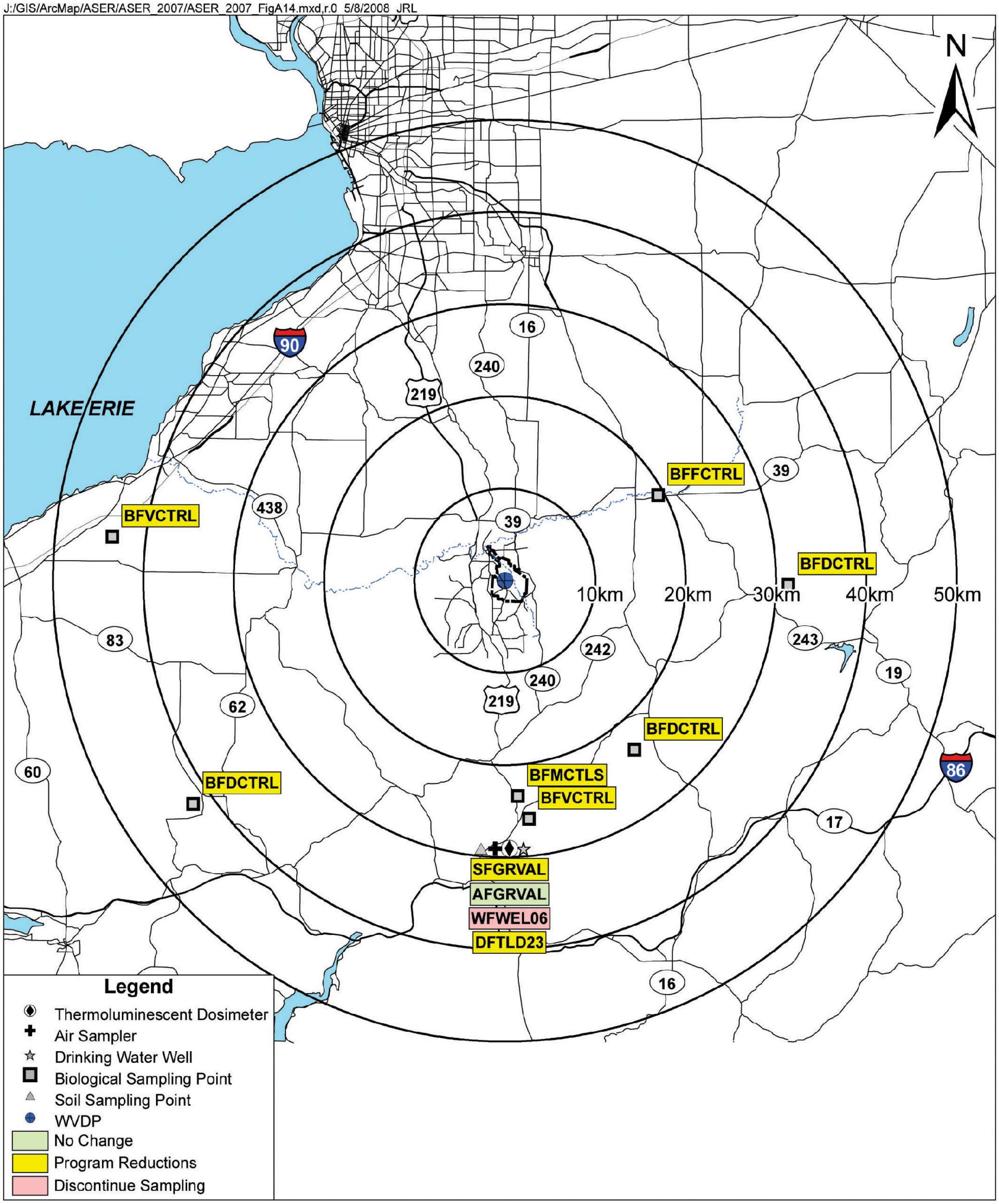
FIGURE A-13
Environmental Sampling Locations Between 5 and 10 Kilometers From the WVDP



Program changes indicated in color are for CY 2008 (see pages A-19–A-24).

FIGURE A-14
Environmental Sampling Locations More Than 10 Kilometers From the WVDP

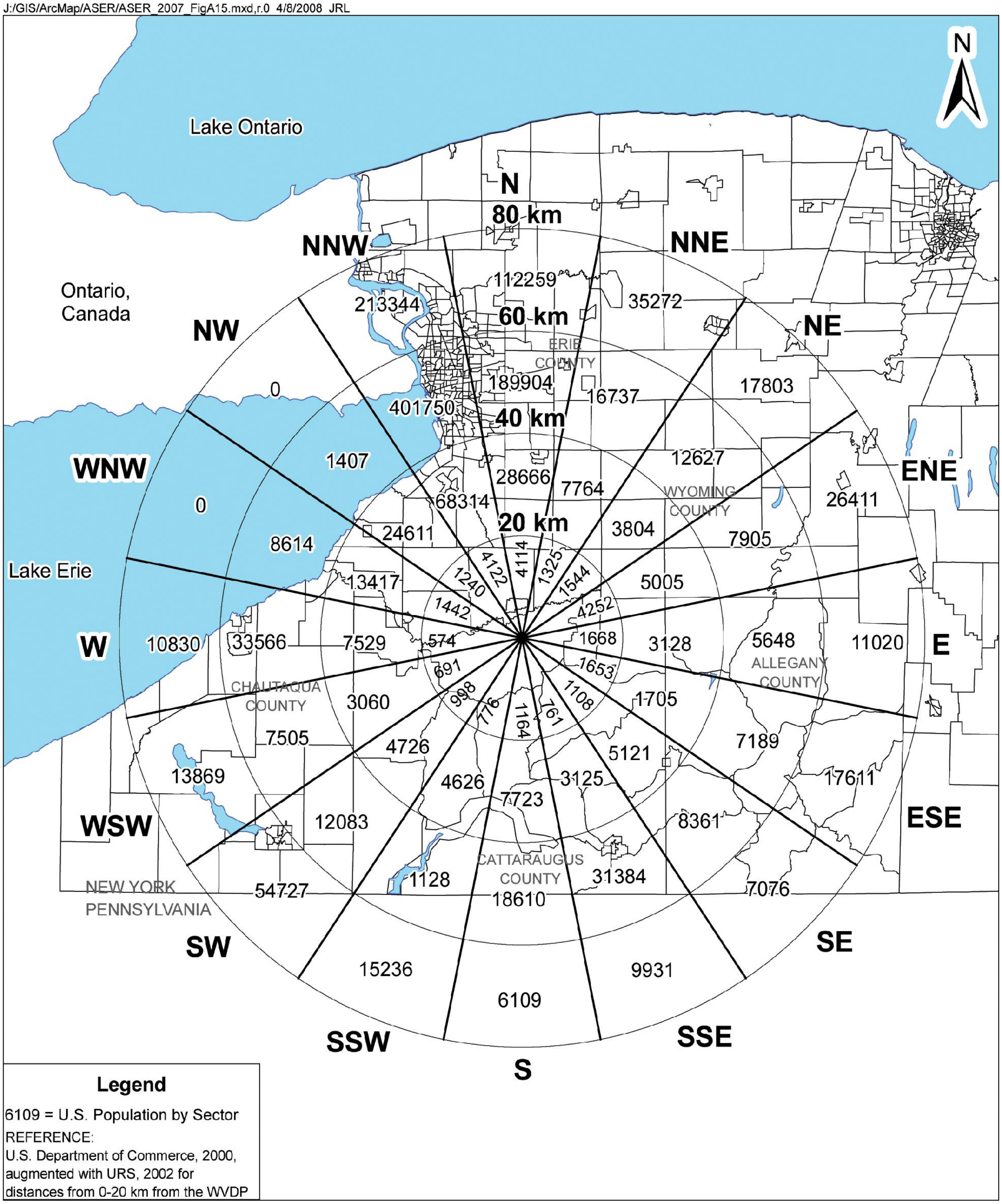
J:/GIS/ArcMap/ASER/ASER_2007/ASER_2007_FigA14.mxd,r.0 5/8/2008 JRL



Program changes indicated in color are for CY 2008 (see pages A-19–A-24).

FIGURE A-15
U.S. Population by Sector Within 80 Kilometers of the WVDP (2002 Estimate)

J:/GIS/ArcMap/ASER/ASER_2007_FigA15.mxd,r.0 4/8/2008 JRL



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USEFUL INFORMATION

This section provides background information that may be useful to the reader in understanding and interpreting the results presented in this Annual Site Environmental Report (ASER). First, it presents brief summaries of concepts pertaining to radiation and radioactivity, including:

- radioactive decay;
- types of ionizing radiation;
- measurement of radioactivity;
- measurement of dose;
- background radiation; and
- potential health effects of radiation.

It describes how data are presented in the ASER, and presents tables of unit prefixes, units of measure, and conversion factors. It discusses limits applicable to air emissions and water effluents, and describes (and presents a table of) the dose-based DOE derived concentration guides (DCGs). It includes a discussion of CAP88-PC, the computer code used to evaluate compliance with the air dose standard. It also presents discussions of 1) water quality classifications, standards, and limits for ambient water; 2) potable water standards; 3) soil and sediment guidelines; and 4) evaluation of monitoring data with respect to limits.

Radiation and Radioactivity

Radioactivity is a property of atoms with unstable nuclei. The unstable nuclei spontaneously decay by emitting radiation in the form of energy (such as gamma rays) or particles (such as alpha and beta particles) (see inset on following page). If the emitted energy or particle has enough energy to break a chemical bond or to knock an electron loose from another atom, a charged particle (an "ion") may be created. This radiation is known as "ionizing radiation."

As used in this ASER, the term "radiation" refers only to ionizing radiation and does not include nonionizing forms of radiation such as visible light, radio waves, microwaves, infrared light, or ultraviolet light.

Radioactive Decay

An atom is the smallest particle of an element. It cannot be broken down by chemical means. An atom consists of a central core (the *nucleus*), composed of positively charged particles (*protons*) and particles with no charge (*neutrons*), surrounded by negatively charged particles (*electrons*) that revolve in orbits in the region surrounding the nucleus. The protons and neutrons are much more massive than the electrons, therefore most of an atom's mass is in the nucleus.

An element is defined by the number of protons in its nucleus, its atomic number. For example, the atomic number of hydrogen is one (one proton), the atomic number of strontium is 38 (38 protons), and the atomic number of cesium is 55 (55 protons).

The mass number of an atom, its *atomic weight*, is equal to the total number of protons and neutrons in its nucleus. For example, although an atom of hydrogen will always have one proton in its nucleus, the number of neutrons may vary. Hydrogen atoms with zero, one, or two neutrons will have atomic weights of one, two, or three, respectively. These atoms are known as *isotopes* (or *nuclides*) of the element hydrogen. Elements may have many isotopes. For instance, the elements strontium and cesium have more than 30 isotopes each.

Isotopes may be stable or unstable. An atom from an unstable isotope will spontaneously change to another atom. The process by which this change occurs, that is, the spontaneous emission from the nucleus of alpha or beta particles, often accompanied by gamma radiation, is known as *radioactive decay*. Depending upon the type of radioactive decay, an atom may be transformed to another isotope of the same element or, if the number of protons in the

Note: Much of the background information in this section was taken from The Handbook of Health Physics and Radiological Health (Shleien, 1998), from the Environmental Protection Agency website (www.epa.gov/radiation/understand), and from The Health Physics Society website (http://hps.org/publicinformation).

Some Types of Ionizing Radiation

Alpha Particles. An alpha particle is a fragment of a much larger nucleus. It consists of two protons and two neutrons (similar to the nucleus of a helium atom) and is positively charged. Compared to beta particles, alpha particles are relatively large and heavy and do not travel very far when ejected by a decaying nucleus. Therefore, alpha radiation is easily stopped by a few centimeters of air or a thin layer of material, such as paper or skin. However, if radioactive material is ingested or inhaled, the alpha particles released inside the body can damage soft internal tissues because their energy can be absorbed by tissue cells in the immediate vicinity of the decay. An example of an alpha-emitting radionuclide is the uranium isotope with an atomic weight of 232 (uranium-232). Uranium-232 was in the high-level waste (HLW) mixture at the West Valley Demonstration Project (WVDP) as a result of a thorium-based nuclear fuel reprocessing campaign conducted by Nuclear Fuel Services, Inc. Uranium-232 has been detected in liquid waste streams.

Beta Particles. A beta particle is an electron emitted during the breakdown of a neutron in a radioactive nucleus. Compared to alpha particles, beta particles are smaller, have less of a charge, travel at a higher speed (close to the speed of light), and can be stopped by wood or a thin sheet of aluminum. If released inside the body, beta particles do much less damage than an equal number of alpha particles because beta particles deposit energy in tissue cells over a larger volume than alpha particles. Strontium-90, a fission product found in the liquids associated with the HLW, is an example of a beta-emitting radionuclide.

Gamma Rays. Gamma rays are high-energy "packets" of electromagnetic radiation, called photons, that are emitted from the nucleus. Gamma rays are similar to x-rays, but are generally more energetic. If an alpha or beta particle released by a decaying nucleus does not carry off all the energy generated by the nuclear disintegration, the excess energy may be emitted as gamma rays. If the released energy is high, a very penetrating gamma ray is produced that can be effectively reduced only by shielding consisting of several inches of a dense material, such as lead, or of water or concrete several feet thick. Although large amounts of gamma radiation are dangerous, gamma rays are also used in lifesaving medical procedures. An example of a gamma-emitting radionuclide is barium-137m, a short-lived daughter product of cesium-137. Both barium-137m and its precursor, cesium-137, are major constituents of the WVDP HLW.

nucleus has changed, to an isotope of another element.

Isotopes (nuclides) that undergo radioactive decay are called *radioactive* and are known as *radioisotopes* or *radionuclides*. Radionuclides are customarily referred to by their atomic weights. For instance, the radionuclides of hydrogen, strontium, and cesium measured at the WVDP are hydrogen-3 (also known as tritium), strontium-90, and cesium-137. For some radionuclides, such as cesium-137, a short-lived intermediate is formed that decays by gamma emission. This intermediate radionuclide may be designated by the letter "m" (for metastable) following the atomic weight. For cesium-137, the intermediate radionuclide is barium-137m, with a half-life of less than three minutes.

The process of radioactive decay will continue until only a stable, nonradioactive isotope remains. Depending on the radionuclide, this process can take anywhere from less than a second to billions of years. The time required for half of the radioactivity to decay is called the radionuclide's *half-life*. Each radionuclide has a unique half-life. The half-life of hydrogen-3 is slightly more than 12 years, both strontium-90 and cesium-137 have half-lives of approximately 30 years, and plutonium-239 has a half-life of more than 24,000 years.

Knowledge of radionuclide half-lives is often used to estimate past and future inventories of radioactive material. For example, a 1.0 millicurie source of cesium-137 in 2006 would have measured 2.0 millicuries in 1976 and will be 0.5 millicuries in 2036. For a list of half-lives of radionuclides applicable to the WVDP, see Table UI-4.

Measurement of Radioactivity

As they decay, radionuclides emit one or more types of radiation at characteristic energies that can be measured and used to identify the radionuclide. Detection instruments measure the quantity of radiation emitted over a specified time. From this measurement, the number of decay events (nuclear transformations) over a fixed time can be calculated.

Radioactivity is measured in units of curies (Ci) or becquerels (Bq). One Ci (based on the rate of decay of one gram of radium-226) is defined as the "quantity of any radionuclide that undergoes an average transformation rate of 37 billion transformations per second." In the International System of Units (SI), one Bq is equal to one transformation per second. In this ASER, radioactivity is customarily expressed in units of Ci followed by the equivalent SI unit in parentheses, as follows: 1 Ci (3.7E+10 Bq).

In this report, measurements of radioactivity in a defined volume of an environmental media, such as air or water, are presented in units of concentration. Since levels of radioactivity in the environment are typically very low, concentrations may be expressed in microcuries per milliliter, with SI units (becquerels per liter) in parentheses, as follows: 1.00E-06 µCi/mL (3.7E+01 Bq/L). (One microcurie is equal to one millionth of a curie.)

Measurement of Dose

The amount of energy absorbed by a material that receives radiation is measured in rads. A rad is 100 ergs of radiation energy absorbed per gram of material. (An erg is the approximate amount of energy necessary to lift a mosquito one-sixteenth of an inch.) "Dose" is a means of expressing the amount of energy absorbed, taking into account the effects of different kinds of radiation.

Alpha, beta, and gamma radiation affect the body to different degrees. Each type of radiation is given a quality factor that indicates the extent of human cell damage it can cause compared with equal amounts of other ionizing radiation energy. Alpha particles cause 20 times as much damage to internal tissues as x-rays, so alpha radiation has a quality factor of 20, compared to gamma rays, x-rays, or beta particles, each of which have a quality factor of one.

The unit of dose measurement to humans is the *rem*. The number of rem is equal to the number of rads multiplied by the quality factor for each type of radiation. In the SI system, dose is expressed in sieverts. One sievert (Sv) equals 100 rem. This ASER expresses dose in standard units, followed by equivalent SI units in parentheses, as follows: 1 mrem (0.01 Sv).

Background Radiation

Background radiation is always present, and everyone is constantly exposed to low levels of such radiation from both naturally occurring and man-made sources. In the United States the average total annual exposure to low-level background radiation is estimated to be about 360 millirem (mrem) or 3.6 millisieverts (mSv). Most of this radiation, approximately 295 mrem (2.95 mSv), comes from natural sources. The rest comes from medical procedures, consumer products, and other man-made sources (National Council on Radiation Protection and Measurements Report 93, 1987). (See Figure 3-1 in Chapter 3.)

Background radiation includes cosmic rays; the decay of natural elements, such as potassium, uranium, thorium, and radon; and radiation from sources such as chemical fertilizers, smoke detectors, and cigarettes. Actual doses vary depending on such factors as geographic location, building ventilation, and personal health and habits.

Potential Health Effects of Radiation

The three primary pathways by which people may be exposed to radiation are (1) direct exposure, (2) inhalation, and (3) ingestion. Exposure from radiation may be from a source outside the body (external exposure) or from radioactive particles that have been taken in by breathing or eating and have become lodged inside the body (internal exposure). Radionuclides that are taken in are not distributed in the same way throughout the body. Radionuclides of strontium, plutonium, and americium concentrate in the skeleton, while radioisotopes of iodine concentrate in the thyroid. Radionuclides such as hydrogen-3 (tritium), carbon-14, or cesium-137, however, will be distributed uniformly throughout the body.

Living tissue in the human body can be damaged by ionizing radiation. The severity of the damage depends upon several factors, among them the amount of exposure (low or high), the duration of the exposure (long-term [*chronic*] or short-term [*acute*]), the type of radiation (alpha, beta, and gamma radiations of various energies), and the sensitivity of the human (or organ) receiving the radiation. The human body has mechanisms that repair damage from exposure to radiation, however, repair processes are not always successful.

Biological effects of exposure to radiation may be either somatic or genetic. *Somatic* effects are limited to the exposed individual. For example, a sufficiently high exposure could cause clouding of the lens of the eye or a decrease in the number of white blood cells. *Genetic* effects may show up in future generations. Radiation could damage chromosomes, causing them to break or join incorrectly with other chromosomes. Radiation-produced genetic defects and mutations in the offspring of an exposed parent, while not positively identified in humans, have been observed in some animal studies.

Assessing the biological damage from low-level radiation is difficult because other factors can cause the same symptoms as radiation exposure. Moreover, the body is able to repair damage caused by low-level radiation. Epidemiological studies have not demonstrated adverse health effects in individuals exposed to small doses (less than 10 rem) over a period of years. (For comparison, note that average background radiation in the United States is about 0.36 rem/year, and estimated annual dose from activities at the WVDP in 2007 was about 0.000067 rem/year [0.067 mrem/year].)

The effect most often associated with exposure to relatively high levels of radiation appears to be an increased risk of cancer. However, scientists have not been able to demonstrate with certainty that exposure to low-level radiation causes an increase in injurious biological effects, nor have they been able to determine if there is a level of radiation exposure below which there are no adverse biological effects.

Data Reporting

In the text of this ASER, radiological units (e.g., rem, rad, curie) are presented first, followed by the International System of Units (SI) equivalent in parentheses. Nonradiological measurements are presented in English units, followed by the metric unit equivalent in parentheses. See Tables UI-1, UI-2, and UI-3 for a summary of unit prefixes, units of measurement, and basic conversion factors used in this ASER.

Where results are very large or very small, scientific notation is used. Numbers greater than 10 are expressed with a positive exponent. To convert the number to its decimal form, the decimal point must be moved to the right by the number of places equal to the exponent. For example, 1.0E+06 would be expressed as 1,000,000 (one million). Numbers smaller than 1 are expressed with a negative exponent. For example, 1.0E-06 would be expressed as 0.000001 (one millionth).

TABLE UI-1
Unit Prefixes Used in This ASER

Multiplication factor			
Scientific notation	**Decimal form**	**Prefix**	**Symbol**
1.0E+06	1000000	mega	M
1.0E+03	1000	kilo	k
1.0E-02	0.01	centi	c
1.0E-03	0.001	milli	m
1.0E-06	0.000001	micro	µ
1.0E-09	0.000000001	nano	n
1.0E-12	0.000000000001	pico	p

Radiological data are reported as a result plus or minus (±) an associated uncertainty, customarily the 95% confidence interval. The uncertainty is in part due to the random nature of radioactive decay. Generally, the relative uncertainty in a measurement increases as the amount of radioactivity being sampled decreases. For this reason, low-level environmental analyses for radioactivity are especially prone to significant uncertainty in comparison with the result. Radiological data are presented in the following manner:

Example: 1.04 ± 0.54 E-09

Where:
1.04 = the result
± 0.54 = plus or minus the associated uncertainty
E-09 = times 10 raised to the power -09

A result is considered "positive" if the result is larger than the associated uncertainty (i.e., the constituent was detected). Nonradiological data are not reported with an associated uncertainty.

In general, the detection limit is the minimum amount of a constituent that can be detected, or distinguished from background, by an instrument or a measurement technique. If a result is preceded by the symbol "<" (i.e., <5 ppm), the constituent was not measurable below the detection limit (in this example, 5 ppm).

TABLE UI-2
Units of Measure Used in This ASER

Type	Measurement	Symbol	Type	Measurement	Symbol
Length	meter	m	**Dose**	rad (absorbed dose)	rad
	centimeter	cm		rem (dose equivalent)	rem
	kilometer	km		millirem	mrem
	inch	in		sievert	Sv
	foot	ft		millisievert	mSv
	mile	mi		gray	Gy
Volume	gallon	gal	**Exposure**	roentgen	R
	liter	L		milliroentgen	mR
	milliliter	mL		microroentgen	µR
	cubic meter	m^3	**Concentration**	parts per million	ppm
	cubic feet	ft^3		parts per billion	ppb
Area	acre	ac		parts per trillion	ppt
	hectare	ha		milligrams per L (ppm)	mg/L
	square meter	m^2		micrograms per L (ppb)	µg/L
	square foot	ft^2		nanograms per L (ppt)	ng/L
Temperature	degrees Fahrenheit	^oF		milligrams per kg (ppm)	mg/kg
	degrees Celsius	^oC		micrograms per g (ppm)	µg/g
Mass	gram	g		micrograms per mL (ppm)	µg/mL
	kilogram	kg		milliliters per mL	mL/L
	milligram	mg		microcuries per mL	µCi/mL
	microgram	µg		picocuries per L	pCi/L
	nanogram	ng		microcuries per g	µCi/g
	pound	lb		Becquerels per L	Bq/L
	tonne (metric ton)	t		nephelometric turbidity units	NTU
	ton, short	T		standard units (pH)	SU
Radoactivity	curie	Ci	**Flow rate**	gallons per day	gpd
	millicurie	mCi		million gallons per day	mgd
	microcurie	µCi		cubic feet per minute	cfm
	nanocurie	nCi		liters per minute	lpm
	picocurie	pCi		meters per second	m/sec
	becquerel	Bq			

TABLE UI-3
Conversion Factors Used in This ASER

To convert from	to	Multiply by
miles	kilometers	1.609344
feet	meters	0.3048
inches	centimeters	2.54
acres	hectares	0.4046873
pounds	kilograms	0.45359237
gallons	liters	3.785412
curies	becquerels	3.7E+10
rad	gray	0.01
rem	sievert	0.01

Note: To convert from the units in column two to the units in column one, divide by the conversion factor.

The number of significant digits reported depends on the precision of the measurement technique. Integer counts are reported without rounding. Calculated values are customarily reported to three significant figures. Dose estimates are usually reported to two significant figures.

Limits Applicable to Environmental Media

Dose Standards. The two dose standards against which releases at the West Valley Demonstration Project (WVDP) are assessed are those established by the Environmental Protection Agency (EPA) for air emissions and that established by the U.S. Department of Energy (DOE) regarding all exposure modes from DOE activities.

Radiological air emissions other than radon from DOE facilities are regulated by the EPA under the National Emission Standards for Hazardous Air Pollutants (NESHAP) regulation (40 Code of Federal Regulation [CFR] 61, Subpart H), which establishes a standard of 10 mrem/year effective dose equivalent to any member of the public. See "CAP88-PC Computer Code" in inset.

DOE Order 5400.5 sets the DOE primary standard of 100 mrem/year effective dose equivalent to members of the public considering all exposure modes from DOE activities. (Currently there are no EPA standards establishing limits on the radiation dose to members of the public from liquid effluents.)

Note that the EPA establishes a drinking water limit of 4-mrem/year (0.04-mSv/year) (40 CFR Parts 141 and 143, Drinking Water Guidelines). Corollary limits for community water supplies are set by the New York State Department of Health (NYSDOH) in the New York State Sanitary Code (Title 10 of the Official Compilation of Codes, Rules, and Regulations of the State of New York [NYCRR] 5-152). These limits are not applicable at the WVDP because no drinking water sources are affected by the WVDP.

CAP88-PC Computer Code

The WVDP Annual Site Environmental. Report (ASER) summarizes the airborne radioactivity released (see Appendix C[CD]) and the effect from those releases (Chapter 3). The computer code Clean Air Act Assessment Package-1988 for personal computers (CAP88-PC), Version 2.0, approved in October 1999, is used to perform radiation dose and risk calculations from WVDP airborne releases.

Version 3.0 of CAP88-PC (Trinity Engineering Associates, Inc., March 2006, with updates in November 2006, and March, October, and December of 2007) was approved by the EPA for use in February 2006 to demonstrate compliance with the 10-mrem/year NESHAP standard. Version 3.0 incorporates updated scientific methods to calculate radiation dose and risk. Version 3.0 also considers age and gender factors not considered in Version 2.0. Both versions use weighting factors that consider the sensitivity of various human organs to radiation. The models also calculate how long radioactive material will remain in a particular organ or system. Together, these factors are used to calculate dose and risk. Version 2.0 uses seven different organs and Version 3.0 uses 23. The risk of getting cancer from radiation exposure is calculated for 15 sites in Version 3.0 versus 10 in Version 2.0.

Upon initial and follow-up evaluation of code releases through December 2007, issues were encountered in running this new software code. At this juncture, the EPA accepts the use of any of the three approved versions of CAP88 for compliance purposes. After final evaluation (post-revision) at the WVDP, this updated (Version 3.0) code, or an appropriate approved alternative, will be used in the future at the WVDP, as recommended in the Federal Register notice.

The net effect is that dose and risk estimates summarized in the ASER from using CAP88-PC Version 2.0 and Version 3.0 are slightly different, even if the radioactivity released from WVDP and meteorology both remain constant. However, test calculations with both versions have resulted in estimated doses far below the compliance limit.

Derived Concentration Guides. A derived concentration guide (DCG) is defined as the concentration of a radionuclide in air or water that, under conditions of continuous exposure by one exposure mode (i.e., ingestion of water, immersion in air, or inhalation) for one year, would result in an effective dose equivalent of 100 mrem (1 mSv) to a "reference man" (DOE Order 5400.5). DCGs are applicable only at locations where members of the public could be exposed to air or water containing contaminants. DCGs for radionuclides measured at the WVDP are listed in Table UI-4. At the WVDP, DCGs are used as a screening tool for evaluating liquid effluents and airborne emissions. (DCGs are not used to estimate dose.)

State Pollutant Discharge Elimination System (SPDES) Permit Requirements. The site's SPDES permit defines points where sampling must be conducted, sampling frequency, the type of samples to be collected, constituents for which samples must be analyzed, and the limits applicable to these constituents. Results are reported monthly to the New York State Department of Environmental Conservation in a Discharge Monitoring Report. Requirements of the current permit are summarized in Appendix B-1.

Water Quality Classifications, Standards, and Limits for Ambient Water. The objective of the Clean Water Act of 1972 (CWA) is to restore and maintain the integrity of the nation's waters and ensure that, wherever attainable, waters be made useful for fishing and swimming. To achieve this goal, New York State is delegated with authority under Sections 118, 303, and 510 of the CWA to (1) classify and designate the best uses for receiving waters, such as streams and rivers, within its jurisdiction, and (2) establish and assign water quality standards — goals for achieving the designated best uses for these classified waters.

In addition to achieving CWA goals for fishing and swimming, New York has further classified its jurisdictional waters and established ambient water standards, guidelines, and maximum contaminant levels (MCLs) to achieve objectives under the Safe Drinking Water Act for drinking water. These standards serve as the basis for periodic evaluation of the integrity of the receiving waters and identification of needed controls.

The definitions for best usage classification of New York's jurisdictional waters and the water quality standard goals for these classifications are provided in Title 6 of the Official Compilation of Codes, Rules, and Regulations of the State of New York (6 NYCRR) Parts 701–704. Mapping of the Cattaraugus Creek drainage basin and assignment of best usage designations and classification to each receiving water segment within this drainage basin are described in 6 NYCRR Part 838.

According to these regulations, Franks Creek, Quarry Creek, and segments of Buttermilk Creek under the influence of water effluents from the WVDP are identified as Class "C" receiving waters with a minimum designated best usage for fishing with conditions suitable for fish propagation and survival.

Cattaraugus Creek, in the immediate downstream vicinity of the Western New York Nuclear Service Center (WNYNSC), is identified as a Class "B" receiving water with best designated usages for swimming and fishing. All fresh (nonsaline) groundwaters within New York are assigned a "GA" classification with a designated best usage as a potable water supply source.

Refer to Appendix B for a summary of the water quality standards, guidelines, and MCLs assigned to these water classifications for those constituents that are included in the WVDP environmental monitoring program for ambient water.

Potable Water Standards. Standards for drinking water are established by the EPA and by NYSDOH. These standards are expressed as MCLs or maximum contaminant level goals. See Appendix B for a summary of these levels.

Soil and Sediment Concentration Guidelines. The Nuclear Regulatory Commission (NRC) and the EPA, in a 2002 memorandum of understanding pertaining to decommissioning and decontamination of contaminated sites, agreed upon concentrations of residual radioactivity in soil that would trigger consultation between the two agencies. Consultation "trigger" levels for radioactive contamination in both residential and industrial soil are listed in Appendix F for nuclides applicable to the WVDP.

In 2006, the NRC, in a decommissioning guidance document (NUREG-1757, Vol. 2, 2006), provided concentration screening values for common radionuclides in soil that could result in a dose of 25 mrem/year. For summary tables of screening levels for radionuclides of interest at the WVDP, see Appendix F.

In 1999, NYSDEC issued updated guidance for screening contaminated aquatic sediments. This guidance includes sediment quality criteria correlated to the severity of environmental impact. These criteria, which are derived from National Oceanic and Atmospheric Administration (Long and Morgan, 1990) and 1992 Ministry of Ontario "Guidelines for the Protection and Management of Aquatic Sediment Quality in Ontario" (Persaud et al., 1992), are presented in Appendix F.

Contaminants in soil are potential sources for contamination of groundwater, ambient air, and plants and animals. Appendix F includes a summary of screening criteria from NYSDEC and 6 NYCRR. Criteria include background concentration ranges for eastern United States soil.

Evaluation of Monitoring Data with Respect to Limits

Monitoring data for calendar year 2007 were evaluated against the limits presented in Table UI-4, and Appendices B and F. Those locations with results exceeding the limits are listed in Chapter 2, Table 2-4.

TABLE UI-4
U.S. Department of Energy Derived Concentration Guides (DCGs)[a] for Inhaled Air or Ingested Water (µCi/mL)

Radionuclide	Half-life (years)[b]	DCG in Air	DCG in Water
Gross Alpha (as Am-241)[c]	NA	2E-14	3E-08
Gross Beta (as Sr-90)[c]	NA	9E-12	1E-06
Tritium (H-3)	1.23E+01	1E-07	2E-03
Carbon-14 (C-14)	5.70E+03	6E-09	7E-05
Potassium-40 (K-40)	1.25E+09	9E-10	7E-06
Cobalt-60 (Co-60)	5.27E+00	8E-11	5E-06
Strontium-90 (Sr-90)	2.89E+01	9E-12	1E-06
Technetium-99 (Tc-99)	2.11E+05	2E-09	1E-04
Iodine-129 (I-129)	1.57E+07	7E-11	5E-07
Cesium-137 (Cs-137)	3.00E+01	4E-10	3E-06
Europium-154 (Eu-154)	8.59E+00	5E-11	2E-05
Uranium-232 (U-232)	6.89E+01	2E-14	1E-07
Uranium-233 (U-233)	1.59E+05	9E-14	5E-07
Uranium-234 (U-234)	2.46E+05	9E-14	5E-07
Uranium-235 (U-235)	7.04E+08	1E-13	6E-07
Uranium-236 (U-236)	2.34E+07	1E-13	5E-07
Uranium-238 (U-238)	4.47E+09	1E-13	6E-07
Plutonium-238 (Pu-238)	8.77E+01	3E-14	4E-08
Plutonium-239 (Pu-239)	2.41E+04	2E-14	3E-08
Plutonium-240 (Pu-240)	6.56E+03	2E-14	3E-08
Americium-241 (Am-241)	4.32E+02	2E-14	3E-08

[a] DCGs are established in DOE Order 5400.5 and are defined as the concentration of a radionuclide that, under conditions of continuous exposure for one year by one exposure mode, would result in an effective dose equivalent of 100 mrem (1 mSv).

[b] Nuclear Wallet Cards. April 2005. National Nuclear Data Center. Brookhaven National Laboratory. Upton, New York.

[c] Because there are no DCGs for gross alpha and gross beta concentrations, the DCGs for the most restrictive alpha and beta emitters at the WVDP (americium-241 and strontium-90, respectively) are used as a conservative basis for comparison at locations for which there are no radionuclide-specific data, in which case a more appropriate DCG may be applied.

GLOSSARY

A

accuracy - The degree of agreement between a measurement and its true value. The accuracy of a data set is assessed by evaluating results from standards or sample spikes containing known quantities of an analyte.

action plan - An action plan addresses assessment findings and root causes that have been identified in an audit or an assessment report. It is intended to define specific actions that the responsible group will undertake to remedy deficiencies. The plan includes a timetable and resource requirements for implementation of the planned activities.

aquifer - A water-bearing unit of permeable rock or soil that will yield water in usable quantities via wells. Confined aquifers are bounded above and below by less permeable layers. Groundwater in a confined aquifer may be under a pressure greater than the atmospheric pressure. Unconfined aquifers are bounded below by less permeable material, but are not bounded above. The pressure on the groundwater at the surface of an unconfined aquifer is equal to that of the atmosphere.

as low as reasonably achievable (ALARA) - An approach to radiation protection that advocates controlling or managing exposures (both individual and collective) to the work force and the general public and releases of radioactive material to the environment as low as social, technical, economic, practical, and public policy considerations permit. As used in United States Department of Energy (DOE) Order 5400.5, ALARA is not a dose limit but, rather, a process that has as its objective the attainment of dose levels as far below the applicable limits of the Order as practicable.

B

background radiation - Natural and man-made radiation such as cosmic radiation and radiation from naturally radioactive elements and from commercial sources and medical procedures.

becquerel (Bq) - A unit of radioactivity equal to one nuclear transformation per second.

C

categorical exclusion (CX) - A proposed action that normally does not require an environmental assessment or an environmental impact statement and that the DOE has determined does not individually or cumulatively have a significant effect on the human environment. See 10 Code of Federal Regulations (CFR) 1021.410.

Class A, B, and C low-level waste - Waste classifications from the Nuclear Regulatory Commission's 10 CFR Part 61 rule. Maximum concentration limits are set for specific isotopes. Class A waste disposal is minimally restricted with respect to the form of the waste. Class B waste must meet more rigorous requirements to ensure physical stability after disposal. Higher concentration limits are set for the same isotopes in Class C waste (the most radioactive), which also must meet physical stability requirements. Moreover, special measures must be taken at the disposal facility to protect against inadvertent intrusion.

compliance findings - Conditions that may not satisfy applicable environmental or safety and health regulations, DOE Orders and memoranda, enforcement actions, agreements with regulatory agencies, or permit conditions.

confidence interval - The range of values within which some parameter may be expected to lie with a stated degree of confidence. For example, a value of 10 with an uncertainty of 5 calculated at the 95% confidence level (10±5) indicates there is a 95% probability that the true value of that parameter lies between 5 and 15.

consistency - The condition of showing steady conformity to practices. In the environmental monitoring program, approved procedures are in place so that data collection activities are carried out in a consistent manner to minimize variability.

Core Team - The "core team approach" is a formalized, consensus-based process in which those individuals with decision-making authority, including the U.S. Department of Energy (DOE), the U.S. Environmental Protection Agency (EPA), and State remedial project managers, work together to reach agreement on key remediation decisions (DOE/EH-413-9911, October 1999). In August 2006, the DOE-West Valley Demonstration Project (DOE-WVDP) requested that the New York State Department of Health (NYSDOH), the U.S. Nuclear Regulatory Commission (NRC), the EPA (region 2), the New York State Department of Environmental Conservation (NYSDEC), and the New York State Energy Research and Development Authority (NYSERDA) participate in a collaborative process (i.e., Core Team) to resolve technical issues associated with the "Draft Environmental Impact Statement for Decommissioning and/or Long-Term Stewardship at the West Valley Demonstration Project and Western New York Nuclear Service Center" (DEIS). The WVDP Core Team has been participating in this process since then.

cosmic radiation - High-energy subatomic particles from outer space that bombard the earth's atmosphere. Cosmic radiation is part of natural background radiation.

curie (Ci) - A unit of radioactivity equal to 37 billion (3.7×10^{10}) nuclear transformations per second.

D

data set - A group of data (e.g., factual information such as measurements or statistics) used as a basis for reasoning, discussion, or calculation.

decay (radioactive) - Disintegration of the nucleus of an unstable nuclide by spontaneous emission of charged particles and/or photons or by spontaneous fission.

derived concentration guide (DCG) - The concentration of a radionuclide in air and water that, under conditions of continuous human exposure for one year by one exposure mode (i.e., ingestion of water, inhalation, or immersion in a gaseous cloud), would result in an effective dose equivalent of 100 mrem (1 mSv). See Table UI-4 in the "Useful Information" section of this report.

detection limit or level (DL) - This term may also be expressed as "method detection limit" (MDL). The smallest amount of a substance that can be distinguished in a sample by a given measurement procedure at a given confidence level. (See *lower limit of detection*.)

dispersion (airborne) - The process whereby particulates or gases are spread and diluted in air as they move away from a source.

dispersion (groundwater) - The process whereby solutes are spread or mixed as they are transported by groundwater as it moves through the subsurface.

dosimeter - A portable device for measuring the total accumulated exposure to ionizing radiation.

downgradient - The direction of water flow from a reference point to a selected point of interest at a lower elevation than the reference point. (See *gradient*.)

E

effective dose - (See *effective dose equivalent* under *radiation dose*.)

effluent - Any treated or untreated air emission or liquid discharge to the environment.

effluent monitoring - Sampling or measuring specific liquid or gaseous effluent streams for the presence of pollutants to determine compliance with applicable standards, permit requirements, and administrative controls.

environmental assessment (EA) - An evaluation that provides sufficient evidence and analysis for determining whether an environmental impact statement is required or a finding of no significant impact should be issued. See 10 CFR 1021.

environmental impact statement (EIS) - A detailed statement that includes the environmental impact of the proposed action, any adverse environmental effects that cannot be avoided should the proposal be implemented, and alternatives to the proposed action. Detailed information may be found in Section 10 CFR 1021.

environmental management system (EMS) - The systematic application of business management practices to environmental issues, including defining the organizational structure, planning for activities, identifying responsibilities, and defining practices, procedures, processes, and resources.

environmental monitoring - The collection and analysis of samples or the direct measurement of environmental media. Environmental monitoring consists of two major activities: effluent monitoring and environmental surveillance.

environmental surveillance - The collection and analysis of samples or the direct measurement of air, water, soil, foodstuff, and biota in the environs of a facility of interest to determine compliance with applicable standards and to detect trends and environmental pollutant transport.

exposure - The subjection of a target (usually living tissue) to radiation.

F

fallout - The settling to earth of radioactive materials mixed into the earth's atmosphere.

finding - A DOE compliance term. A finding is a statement of fact concerning a condition in the Environmental, Safety, and Health program that was investigated during an appraisal. Findings include best management practice findings, compliance findings, and noteworthy practices. A finding may be a simple statement of proficiency or a description of deficiency (i.e., a variance from procedures or criteria). (See also *self-assessment*.)

fission - The act or process of splitting into parts. A nuclear reaction in which an atomic nucleus splits into fragments (i.e., fission products, usually fragments of comparable mass) with the evolution of approximately 100 million to several hundred million electron volts of energy.

G

gamma isotopic (also *gamma scan*) - An analytical method by which the quantity of several gamma ray-emitting radioactive isotopes may be determined simultaneously. Typical nuclear fuel cycle isotopes determined by this method include, but are not limited to, cobalt-60, zirconium-95, ruthenium-106, silver-110m, antimony-125, cesium-134, cesium-137, and europium-154. Naturally occurring isotopes for which samples also often are analyzed are beryllium-7, potassium-40, radium-224, and radium-226.

gradient - Change in value of one variable with respect to another variable, such as a vertical change over a horizontal distance.

groundwater - Subsurface water in the pore spaces and fractures of soil and bedrock units.

H

half-life - The time in which half the atoms of a radionuclide disintegrate into another nuclear form. The half-life may vary from a fraction of a second to billions of years.

hazardous waste - A waste or combination of wastes that because of quantity, concentration, or physical, chemical, or infectious characteristics may: a) cause or significantly contribute to an increase in mortality or an increase in serious irreversible or incapacitating reversible illness; or (b) pose a substantial present or potential hazard to human health or the environment when improperly treated, stored, transported, disposed of, or otherwise managed.

high-level waste (HLW) - The highly radioactive waste material that results from the reprocessing of spent nuclear fuel, including liquid waste produced directly in reprocessing and solid waste derived from the liquid, that contains a combination of transuranic waste and fission products in concentrations sufficient to require permanent isolation. (See also *transuranic waste*.)

hydraulic conductivity - The ratio of flow velocity to driving force for viscous flow under saturated conditions of a specified liquid in a porous medium; the ratio describing the rate at which water can move through a permeable medium.

I

integrated safety management system (ISMS) - The ISMS describes the programs, policies, and procedures used by West Valley Environmental Services LLC (WVES) and the DOE to ensure that WVES establishes a safe workplace for the employees, the public, and the environment. The guiding principles of ISMS are line management responsibility for safety; clear roles and responsibilities; competence commensurate with responsibilities; balanced priorities; identification of safety standards and requirements; hazard controls; and operations authorization.

interim status - The status of any currently existing facility that becomes subject to the requirement to have a Resource Conservation and Recovery Act (RCRA) permit because of a new statutory or regulatory amendment to RCRA.

ion - An atom or group of atoms with an electric charge.

ion exchange - The reversible exchange of ions contained in solution with other ions that are part of the ion-exchange material.

isotope - Different forms of the same chemical element that are distinguished by having the same number of protons but a different number of neutrons in the nucleus. An element can have many isotopes. For example, the three isotopes of hydrogen are protium, deuterium, and tritium, with one, two, and three neutrons in the nucleus, respectively.

L

land disposal restrictions (LDR) - Regulations promulgated by the United States Environmental Protection Agency (EPA) (and by the New York State Department of Environmental Conservation [NYSDEC] in New York State) governing the land disposal of hazardous wastes. The wastes must be treated using the best demonstrated available technology or must meet certain treatment standards before being disposed.

lower limit of detection (LLD) - The lowest limit of a given parameter that an instrument is capable of detecting. A measurement of analytical sensitivity.

low-level waste (LLW) - Radioactive waste not classified as high-level waste, transuranic waste, spent fuel, or uranium mill tailings. (See *Class A, B, and C low-level waste*.)

M

maximally exposed individual (MEI) - On-site (occupational) or off-site (nonoccupational) person that receives the highest dose from a release scenario.

maximally exposed off-site individual (MEOSI) - Member of the general public receiving the highest dose from the effluent release.

mean - The average value of a series of measurements.

metric ton - (See *ton, metric*.)

millirem (mrem) - A unit of radiation dose equivalent that is equal to one one-thousandth of a rem. An individual member of the public can receive up to 100 mrem per year according to DOE standards. This limit does not include radiation received for medical treatment (approximately 65 mrem) or the roughly 295 mrem, on average, that people receive annually from background radiation.

minimum detectable concentration (MDC) or **method detection limit (MDL) -** Depending on the sample medium, the smallest amount or concentration of a radioactive or nonradioactive analyte that can be reliably detected using a specific analytical method. Calculations of the minimum detectable concentrations are based on the lower limit of detection.

mixed waste (MW) - A waste that is both radioactive and RCRA hazardous.

N

n-Dodecane/tributyl phosphate - An organic solution composed of 30% tributyl phosphate (TBP) dissolved in n-dodecane used to first separate the uranium and plutonium from the fission products in dissolved nuclear fuel and then to separate the uranium from the plutonium.

neutron - An electrically neutral subatomic particle in the baryon family with a mass 1,839 times that of an electron, stable when bound in an atomic nucleus, and having a mean lifetime of approximately 16.6 minutes as a free particle.

notice of violation (NOV) - Generally, an official notification from a regulatory agency of noncompliance with permit requirements. (An example would be a letter of notice from a regional water engineer in response to an instance of significant noncompliance with a State Pollutant Discharge Elimination System [SPDES] permit.)

nucleus - The positively-charged central region of an atom, made up of protons and neutrons and containing almost all of the mass of the atom.

O

outfall - The discharge end of a drain or pipe that carries wastewater or other liquid effluents into a ditch, pond, or river.

P

parameter - Any of a set of physical properties whose values determine the characteristics or behavior of something (e.g., temperature, pressure, density of air). In relation to environmental monitoring, a monitoring parameter is a constituent of interest. Statistically, the term "parameter" is a calculated quantity, such as a mean or variance, that describes a statistical population.

particulates - Solid particles and liquid droplets small enough to become airborne.

person-rem - The sum of the individual radiation dose equivalents received by members of a certain group or population. It may be calculated by multiplying the average dose per person by the number of persons exposed. For example, a thousand people each exposed to one millirem would have a collective dose of one person-rem.

plume - The distribution of a pollutant in air or water after being released from a source.

practical quantitation limits (PQLs) - The PQL is the minimum concentration of an analyte that can be measured within specified limits of precision during routine laboratory operations (New York State Department of Environmental Conservation, 1991).

precision - The degree of reproducibility of a measurement under a given set of conditions. Precision in a data set is assessed by evaluating results from duplicate field or analytical samples.

proton - A stable, positively-charged subatomic particle in the baryon family with a mass 1,836 times that of an electron.

pseudo-monitoring point - A theoretical monitoring location rather than an actual physical location; a calculation based on analytical test results of samples obtained from other associated, tributary, monitored locations. (Point 116 at the WVDP is classified as a "pseudo" monitoring point because samples are not physically collected at that location. Rather, using analytical results from samples collected from "real" upstream outfall locations, compliance with the total dissolved solids limit in the WVDP's SPDES permit is calculated for this theoretical point.)

Q

quality factor (QF) - The extent of tissue damage caused by different types of radiation of the same energy. The greater the damage, the higher the quality factor. More specifically, the factor by which absorbed doses are multiplied to obtain a quantity that indicates the degree of biological damage produced by ionizing radiation. See *radiation dose*.) The factor is dependent upon radiation type (alpha, beta, gamma, or x-ray) and exposure (internal or external).

R

rad - Radiation absorbed dose. One hundred ergs of energy absorbed per gram of solid material.

radiation - The process of emitting energy in the form of rays or particles that are thrown off by disintegrating atoms. The rays or particles emitted may consist of alpha, beta, or gamma radiation.

***alpha radiation* -** The least penetrating type of radiation. Alpha radiation (similar to a helium nucleus) can be stopped by a sheet of paper or the outer dead layer of skin.

***beta radiation* -** Electrons emitted from a nucleus during fission and nuclear decay. Beta radiation can be stopped by an inch of wood or a thin sheet of aluminum.

***gamma radiation* -** A form of electromagnetic, high-energy radiation emitted from a nucleus. Gamma rays are essentially the same as x-rays and require heavy shielding such as lead, concrete, or steel to be stopped.

***internal radiation* -** Radiation originating from a source within the body as a result of the inhalation, ingestion, or implantation of natural or man-made radionuclides in body tissues.

radiation dose:

***absorbed dose* -** The amount of energy absorbed per unit mass in any kind of matter from any kind of ionizing radiation. Absorbed dose is measured in rads or grays.

***collective dose equivalent* -** The sum of the dose equivalents for all the individuals comprising a defined population. The per capita dose equivalent is the quotient of the collective dose equivalent divided by the population. The unit of collective dose equivalent is person-rem or person-sievert.

collective effective dose equivalent **-** The sum of the effective dose equivalents for the individuals comprising a defined population. Units of measurement are person-rem or person-sievert. The per capita effective dose equivalent is obtained by dividing the collective dose equivalent by the population. Units of measurement are rem or sievert.

committed dose equivalent **-** A measure of internal radiation. The predicted total dose equivalent to a tissue or organ over a fifty-year period after a known intake of a radionuclide into the body. It does not include contributions from sources of external penetrating radiation. Committed dose equivalent is measured in rem or sievert.

committed effective dose equivalent **-** The sum of the committed dose equivalents to various tissues in the body, each multiplied by the appropriate weighting factor. Committed effective dose equivalent is measured in rem or sievert.

total effective dose equivalent **-** The summation of the products of the dose equivalent received by specified tissues of the body and the appropriate weighting factors. It includes the dose from radiation sources internal and/or external to the body. The effective dose equivalent is expressed in units of rem or seivert.

radioactivity - A property possessed by some elements (such as uranium) whereby alpha, beta, or gamma rays are spontaneously emitted.

radioisotope - A radioactive isotope of a specified element. Carbon-14 is a radioisotope of carbon. Tritium is a radioisotope of hydrogen. (See *isotope*.)

radionuclide - A radioactive nuclide. Radionuclides are variations (isotopes) of elements. They have the same number of protons and electrons but different numbers of neutrons, resulting in different atomic masses. There are hundreds of known nuclides, both man-made and naturally occurring.

reference man - A hypothetical aggregation of human physical and physiological characteristics arrived at by international consensus. These characteristics may be used by researchers and public health workers to standardize results of experiments and to relate biological insult to a common base.

rem - An acronym for Roentgen Equivalent Man. A unit of radiation exposure that indicates the potential effect of radiation on human cells.

remote-handled waste - At the WVDP, waste that has an external surface dose rate that exceeds 100 millirem per hour or a high level of alpha and/or beta surface contamination and, therefore, must be handled in such a manner that it does not come into physical contact with workers.

roentgen - A unit of exposure to ionizing radiation. It is that quantity of gamma or x-rays required to produce ions carrying one electrostatic unit of electrical charge in one cubic centimeter of dry air under standard conditions. The unit is named after Wilhelm Roentgen, German scientist who discovered x-rays in 1895.

S

self-assessment - Appraisals of work at the WVDP by individuals, groups, or organizations responsible for overseeing and/or performing the work. Self-assessments are intended to provide an internal review of performance to determine that specific functional areas are in programmatic and site-specific compliance with applicable DOE directives, WVDP procedures, and regulations.

finding **-** A direct and significant violation of applicable DOE, regulatory, or other procedural or programmatic requirements. A finding requires documented corrective action.

observation **-** A condition that, while not a direct and significant violation of applicable DOE, regulatory, or other procedural or programmatic requirements, could result in a finding if not corrected. An observation requires documented corrective action.

good practice **-** A statement of proficiency or confirmed excellence worthy of documenting.

sievert - A unit of dose equivalent from the International System of Units (Systeme Internationale). Equal to one joule per kilogram.

solid waste management unit (swmu) - Any discernible unit at which solid wastes have been placed at any time, irrespective of whether the unit was intended for the management of solid or hazardous waste. Such units include any area at a facility at which solid wastes have been routinely and systematically released or created. (See also *super solid waste management unit*.)

spent fuel - Nuclear fuel that has been used in a nuclear reactor; this fuel contains uranium, activation products, fission products, and plutonium.

spill - A spill or release is defined as "any spilling, leaking, pumping, pouring, emitting, emptying, discharging, injecting, escaping, leaching, dumping, or otherwise disposing of substances from the ordinary containers employed in the normal course of storage, transfer, processing, or use", outside of the intended procedural action.

stakeholder - A person or group that has an investment, share, or interest in something. At the WVDP stakeholders include Project management, scientists, other employees, politicians, regulatory agencies, local and national interest groups, and members of the general public.

standard deviation - An indication of the dispersion of a set of results around their average.

super solid waste management unit (SSWMU) - Individual solid waste management units that have been grouped and ranked into larger units – super solid waste management units – because some individual units are contiguous or so close together as to make monitoring of separate units impractical. This terminology is unique to the WVDP, and is not an official regulatory term. (See also *solid waste management unit*.)

surface water - Water that is exposed to the atmospheric conditions of temperature, pressure, and chemical composition at the surface of the earth.

surveillance - The act of monitoring or observing a process or activity to verify conformance with specified requirements.

T

thermoluminescent dosimeter (TLD) - A device that luminesces upon heating after being exposed to radiation. The amount of light emitted is proportional to the amount of radiation to which the luminescent material has been exposed.

ton, metric (also *tonne*) **-** A unit of mass equal to 1,000 kilograms. (See also Table UI-2, "Units of Measure Used in This ASER.")

ton (*short ton*) **-** A unit of weight equal to 2,000 pounds or 907.1847 kilograms. (See also Table UI-2, "Units of Measure Used in This ASER.)

transuranic (TRU) waste - Waste containing transuranic elements, that is, those elements with an atomic number greater than 92, including neptunium, plutonium, americium, and curium.

U

universal wastes - Wastes subject to special management provisions that are intended to ease the management burden and facilitate recycling of such materials. Four types of waste are currently covered under the universal waste regulations: hazardous waste batteries, hazardous waste pesticides that are either recalled or collected in waste pesticide collection programs, hazardous waste thermostats, and hazardous waste lamps.

upgradient - Referring to the flow of water or air, "upgradient" is analogous to upstream. Upgradient is a point that is "before" an area of study and that is used as a baseline for comparison with downstream or downgradient data. (See *gradient* and *downgradient*.)

V

vitrification - A waste treatment process that encapsulates or immobilizes radioactive wastes in a glassy matrix to prevent them from reacting in disposal sites. Vitrification involves adding chemicals, glass formers, and waste to a heated vessel and melting the mixture into a glass that is then poured into a canister.

W

watershed - The area contained within a drainage divide above a specified point on a stream or river.

water table - The upper surface in a body of groundwater; the surface in an unconfined aquifer or confining bed at which the pore water pressure is equal to atmospheric pressure.

X

x-ray - Penetrating electromagnetic radiations having wave lengths shorter than those of visible light. They are usually produced by bombarding a metallic target with fast electrons in a high vacuum. In nuclear reactions it is customary to refer to photons originating in the nucleus as gamma rays and those originating in the extranuclear part of the atom as x-rays. These rays are sometimes called Roentgen rays after their discoverer, W.C. Roentgen.

ACRONYMS AND ABBREVIATIONS

A

ACM - Asbestos-Containing Material
AEA - Atomic Energy Act
ALARA - As Low As Reasonably Achievable
alpha-BHC - alpha-Hexachlorocyclohexane
ANSI - American National Standards Institute
ASER - Annual Site Environmental Report
ASME - American Society of Mechanical Engineers
ASQ - American Society for Quality
AWQS - Ambient Water Quality Standard

B

BAT - Best Available Technology
BCG - Biota Concentration Guide
BEIR - Biological Effects of Ionizing Radiation
BOD_5 - Biochemical Oxygen Demand (5-day)
BSW - Bulk Storage Warehouse

C

CAA - Clean Air Act
CBS - Chemical Bulk Storage
CCHD - Cattaraugus County Health Department
CCZ - Criticality Control Zone
CD - Compact Disk
CDDL - Construction and Demolition Debris Landfill
CEDE - Committed Effective Dose Equivalent
CEMP - Code of Environmental Management Principles (for Federal Agencies)
CERCLA - Comprehensive Environmental Response, Compensation, and Liability Act
CFR - Code of Federal Regulations
CMS - Corrective Measures Study
CPC - Chemical Process Cell
CPC-WSA - Chemical Process Cell Waste Storage Area
CSPF - Container Sorting and Packaging Facility
CSRF - Contact Size-Reduction Facility
CSS - Cement Solidification System
CTF - (West Valley) Citizen Task Force
CUP - Cask Unloading Pool
CWA - Clean Water Act
CX - Categorical Exclusion
CY - Calendar Year

D

D&D - Decontamination and Decommissioning
DCDFMeth - Dichlorodifluoromethane
DCG - Derived Concentration Guide
DL - Detection Limit or Detection Level
DMR - Discharge Monitoring Report
DOE - (U.S.) Department of Energy
DOE-EM - Department of Energy, Office of Environmental Management
DOE-HQ - Department of Energy, Headquarters Office
DOE-WVDP - Department of Energy, West Valley Demonstration Project (title as of June 2006)
DOT - (U.S.) Department of Transportation

E

E.O. - Executive Order
EA - Environmental Assessment
ECL - (New York State) Environmental Conservation Law
EDE - Effective Dose Equivalent
EHS - Extremely Hazardous Substance
EIS - Environmental Impact Statement
ELAB - (WVDP) Environmental Laboratory
ELAP - (New York State Department of Health) Environmental Laboratory Approval Program
EMS - Environmental Management System
EPA - (U.S.) Environmental Protection Agency
EPCRA - Emergency Planning and Community Right-to-Know Act
ES&H - Environmental, Safety, and Health
ESR - (WVDP) Effluent Summary Report

F

FFCA - Federal Facilities Compliance Act
FIFRA - Federal Insecticide, Fungicide, and Rodenticide Act
FONSI - Finding of No Significant Impact
FR - Federal Register
FRS - Fuel Receiving and Storage
FY - Fiscal Year

G

GEL - General Engineering Laboratory
GTAR - Groundwater Trend Analysis Report

H

HEPA - High-Efficiency Particulate Air (filter)
HLW - High-Level (radioactive) Waste
HPIC - High-Pressure Ion Chamber
HTO - Hydrogen Tritium Oxide
HVAC - Heating, Ventilation, and Air Conditioning

I

IAEA - International Atomic Energy Agency
ICRP - International Commission on Radiological Protection
INL - Idaho National Laboratory
IRTS - Integrated Radwaste Treatment System
ISCORS - Interagency Steering Committee on Radiation Standards
ISMS - Integrated Safety Management System
ISO - International Organization for Standardization
IWSF - Interim Waste Storage Facility

L

LAS - Linear Alkylate Sulfonate
LDR - Land Disposal Restriction
LFR - Live Fire Range
LIMS - Laboratory Information Management System
LLD - Lower Limit of Detection
LLW - Low-Level (radioactive) Waste
LLW2 - Low-Level (liquid) Waste Treatment Facility
LPS - Liquid Pretreatment System
LSA - Lag (Low-Level Radioactive Waste) Storage Area
LSA #1 - Lag Storage Addition #1
LSA #2 - Lag Storage Hardstand #2
LSB - Lag Storage Building
LTR - License Termination Rule
LWTS - Liquid Waste Treatment System

M

MAPEP - Mixed Analyte Performance Evaluation Program
MCL - Maximum Contaminant Level
MCLG - Maximum Contaminant Level Goal
MDC - Minimum Detectable Concentration
MDL - Method Detection Limit (also Minimum Detection Level)
MEI - Maximally Exposed Individual
MEOSI - Maximally Exposed Off-Site Individual
MGD - Million Gallons per Day
MOU - Memorandum of Understanding
MSDS - Material Safety Data Sheet
MW - (Radioactive and Hazardous) Mixed Waste

N

NCRP - National Council on Radiation Protection and Measurements
NDA - Nuclear Regulatory Commission (NRC)-Licensed Disposal Area
NELAC - National Environmental Laboratory Accreditation Conference
NEPA - National Environmental Policy Act
NESHAP - National Emission Standards for Hazardous Air Pollutants
NFS - Nuclear Fuel Services, Inc.
NGVD - National Geodetic Vertical Datum
NH_3 - Ammonia
NIST - National Institute of Standards and Technology
NOAA - National Oceanic and Atmospheric Administration
NOI - Notice of Intent
NOV - Notice of Violation
NO_x - Nitrogen Oxides
NPDES - National Pollutant Discharge Elimination System
NPGRS - North Plateau Groundwater Recovery System
NPOC - Nonpurgeable Organic Carbon
NRC - (U.S.) Nuclear Regulatory Commission
NTS - Nevada Test Site
NYCRR - New York Official Compilation of Codes, Rules, and Regulations
NYS - New York State
NYSDEC - New York State Department of Environmental Conservation
NYSDOH - New York State Department of Health
NYSDOH ELAP - (NYSDOH) Environmental Laboratory Approval Program
NYSDOL - New York State Department of Labor
NYSERDA - New York State Energy Research and Development Authority
NYSGS - New York State Geological Survey

O

OSHA - Occupational Safety and Health Administration
OVE - Outdoor Ventilated Enclosure

P

PCB - Polychlorinated Biphenyl
PE - Professional Engineer
PNL - Pacific Northwest Laboratory
PQL - Practical Quantitation Limit
PTW - Permeable Treatment Wall
PUREX - Plutonium Uranium Reduction Extraction

PVS - Permanent Ventilation System
PVU - Portable Ventilation Unit

Q

QA - Quality Assurance
QAP - Quality Assessment Program (also Quality Assurance Program)
QC - Quality Control
QF - Quality Factor

R

RCRA - Resource Conservation and Recovery Act
REM - Roentgen Equivalent Man
RFI - RCRA Facility Investigation
RHWF - Remote-Handled Waste Facility
RMW - Regulated Medical Waste
ROD - Record of Decision

S

SAR - Safety Analysis Report
SARA - Superfund Amendments and Reauthorization Act
SD - Standard Deviation
SDA - (New York) State-Licensed Disposal Area
SDWA - Safe Drinking Water Act
SI - Systeme Internationale (International System of Units)
SMS - Safety Management System
SO_2 - Sulfur Dioxide
SPCC - Spill Prevention, Control, and Countermeasures (Plan)
SPDES - (New York) State Pollutant Discharge Elimination System
SRM - Standard Reference Material
SSWMU - Super Solid Waste Management Unit
STL - Severn Trent Laboratory
STP - Site Treatment Plan
STS - Supernatant Treatment System
SU - Standard Unit
SVOC - Semivolatile Organic Compound
SWMU - Solid Waste Management Unit

T

TAGM - Technical and Administrative Guidance Memorandum
TBP - Tributyl Phosphate
TCE - Trichloroethylene
TDS - Total Dissolved Solids
TEDE - Total Effective Dose Equivalent
THOREX - Thorium Reduction Extraction
TKN - Total Kjeldahl Nitrogen
TLD - Thermoluminescent Dosimeter
TOC - Total Organic Carbon
TOGS - Technical and Operational Guidance Series
TOX - Total Organic Halides
TRI - Toxic Release Inventory
TRU - Transuranic
TSCA - Toxic Substances Control Act
TSDF - Treatment, Storage, and Disposal Facility
TSS - Total Suspended Solids

U

U.S. - United States
USACE - U.S. Army Corps of Engineers
URS - URS - Washington Division
USC - United States Code
USGS - United States Geological Survey

V

VOC - Volatile Organic Compound
VPP - (U.S. DOE) Voluntary Protection Program

W

WNYNSC - Western New York Nuclear Service Center
WRES - Washington Regulatory and Environmental Services
WVDP - West Valley Demonstration Project
WVES - West Valley Environmental Services LLC
WVNSCO - West Valley Nuclear Services Company
WWTF - Wastewater Treatment Facility

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APPENDIX B-1

Summary of Water Limits, Guidelines, and Standards

TABLE B-1A
West Valley Demonstration Project State Pollutant Discharge Elimination System (SPDES) Sampling Program

Outfall	Parameter	Daily Maximum Limit[a]	Sample Frequency
001 (Process and Storm Wastewater)	Flow	Monitor	2/discharge
	Aluminum, total	14.0 mg/L	1/discharge
	Ammonia (NH_3)	Monitor	2/discharge
	Arsenic, dissolved	0.15 mg/L	1/discharge
	BOD_5	10.0 mg/L	2/discharge
	Iron, total	Monitor	2/discharge
	Zinc, total recoverable	0.48 mg/L	2/year
	Solids, total suspended	45 mg/L	2/discharge
	Cyanide, amenable to chlorination	0.022 mg/L	2/year
	Settleable solids	0.3 mL/L	2/discharge
	pH (range)	6.5–8.5 SU	1/discharge
	Oil and grease	15.0 mg/L	2/discharge
	Sulfate (as S)	Monitor	2/discharge
	Sulfide, dissolved	0.4 mg/L	1/discharge
	Manganese, total	2.0 mg/L	2/year
	Nitrate (as N)	Monitor	2/discharge
	Nitrite (as N)	0.1 mg/L	2/discharge
	Chromium, total recoverable	0.3 mg/L	2/year
	Chromium, hexavalent, total recoverable	0.011 mg/L	1/year
	Cadmium, total recoverable	0.002 mg/L	1/year
	Copper, total recoverable	0.030 mg/L	2/year
	Copper, dissolved	Monitor	2/year
	Lead, total recoverable	0.006 mg/L	4/year
	Nickel, total recoverable	0.14 mg/L	2/year
	Dichlorodifluoromethane	0.01 mg/L	1/year
	Trichlorofluoromethane	0.01 mg/L	1/year
	3,3-dichlorobenzidine	0.01 mg/L	1/year
	Tributyl phosphate	32 mg/L	1/year
	Vanadium, total recoverable	0.014 mg/L	1/discharge
	Cobalt, total recoverable	0.005 mg/L	1/discharge
	Selenium, total recoverable	0.004 mg/L	2/discharge
	Hexachlorobenzene	0.02 mg/L	1/year
	Alpha - BHC	0.00001 mg/L	1/year
	Heptachlor	0.00001 mg/L	2/year
	Surfactants (as LAS)	0.4 mg/L	2/year
	Xylene	0.05 mg/L	1/year
	2-butanone	0.5 mg/L	1/year
	Total dissolved solids	Monitor	2/discharge
	Mercury, total	200 ng/L	2/discharge

[a] Daily average limitations are also identified in the permit but require only monitoring for all parameters except total aluminum (daily average limit - 7.0 mg/L); total suspended solids (daily average limit - 30 mg/L); BOD_5 for the sum of outfalls 001, 007, and 008 (daily average limit - 5.0 mg/L); and ammonia for the sum of outfalls 001 and 007 (daily average limit - 1.49 mg/L).

TABLE B-1A *(concluded)*
West Valley Demonstration Project State Pollutant Discharge Elimination System

Outfall	Parameter	Daily Maximum Limit[a]	Sample Frequency
01B (Internal Process Monitoring Point)	Flow	Monitor	weekly
	Mercury, total	10.0 µg/L	2/month
007 (Sanitary and Utility Wastewater)	Flow	Monitor	3/month
	Ammonia (as NH_3)	Monitor	3/month
	BOD5	10.0 mg/L	3/month
	Iron, total	Monitor	3/month
	Solids, total suspended	45 mg/L	3/month
	Solids, settleable	0.3 mL/L	weekly
	pH (range)	6.5–8.5 SU	weekly
	Nitrite (as N)	0.1 mg/L	3/month
	Oil and grease	15.0 mg/L	3/month
	Chlorine, total residual	0.1 mg/L	weekly
Sum of Outfalls 001, 007, and 008	Iron, total	0.30 mg/L	3/month
	BOD_5	Monitor	3/month
Sum of Outfalls 001 and 007	Ammonia (as NH_3)	2.1 mg/L	3/month
Pseudo-monitoring point (116)	Solids, total dissolved	500 mg/L	2/discharge
Storm Water Outfalls (semiannually; one outfall from each of the eight drainage basins)	pH	Monitor	1/rain event
	Oil and grease	15.0 mg/L	1/rain event

Outfall	Parameter	Action Level	Sample Frequency
001 (Process and Storm Wastewater)	Barium	0.5 mg/L	annual
	Antimony	1.0 mg/L	annual
	Chloroform	0.3 mg/L	annual
	Titanium	0.65 mg/L	semiannual
	Bromide	5.0 mg/L	quarterly
	Boron	2.0 mg/L	quarterly
007 (Sanitary and Utility Wastewater)	Chloroform	0.20 mg/L	annual

Note: Limits for point 008 (French Drain) are not listed because the point has been closed off since 2001.

[a] Daily average limitations are also identified in the permit but require only monitoring for all parameters except total aluminum (daily average limit - 7.0 mg/L); total suspended solids (daily average limit - 30 mg/L); BOD_5 for the sum of outfalls 001, 007, and 008 (daily average limit - 5.0 mg/L); and ammonia for the sum of outfalls 001 and 007 (daily average limit - 1.49 mg/L).

TABLE B-1B
New York State Water Quality Standards and Guidelines[a]

New York Water Quality Standards and Guidelines [a]						
Parameter	**Units**	**Class A**	**Class B**	**Class C**	**Class D**	**Class GA**
Gross Alpha[b]	pCi/L (µCi/mL)	15 (1.5E-08)	--	--	--	15 (1.5E-08)
Gross Beta[c]	pCi/L (µCi/mL)	1,000 (1E-06)	--	--	--	1,000 (1E-06)
Tritium (H-3)	pCi/L (µCi/mL)	20,000 (2E-05)	--	--	--	--
Strontium-90	pCi/L (µCi/mL)	8 (8E-09)	--	--	--	--
Alpha BHC	mg/L	0.000002	0.000002	0.000002	0.000002	0.00001
Aluminum, Dissolved	mg/L	0.10	0.10	0.10	--	--
Aluminum, Total	mg/L	--	--	--	--	--
Ammonia, Total as N	mg/L	0.09–2.1	0.09–2.1	0.09–2.1	0.67–29	2.0
Antimony, Total	mg/L	0.003	--	--	--	0.003
Arsenic, Dissolved	mg/L	0.050	0.150	0.150	0.340	--
Arsenic, Total	mg/L	0.050	--	--	--	0.025
Barium, Total	mg/L	1.00	--	--	--	1.00
Beryllium, Total	mg/L	0.003	[d]	[d]	--	0.003
Boron, Total	mg/L	10.0	10.0	10.0	--	1.00
Bromide	mg/L	2.00	--	--	--	2.00
Cadmium, Dissolved[e]	mg/L	--	--	--	--	--
Cadmium, Total	mg/L	0.005	--	--	--	0.005
Calcium, Total	mg/L	--	--	--	--	--
Chloride	mg/L	250	--	--	--	250
Chromium, Dissolved[e]	mg/L	--	--	--	--	--
Chromium, Total	mg/L	0.05	--	--	--	0.05
Cobalt, Total[f]	mg/L	0.005	0.005	0.005	0.110	--
Conductivity	µmhos/cm@25°C	--	--	--	--	--
Copper, Dissolved[e]	mg/L	--	--	--	--	--
Copper, Total	mg/L	0.20	--	--	--	0.20
Cyanide	mg/L	0.0052	0.0052	0.0052	0.22	0.200
Dissolved Oxygen (minimum)	mg/L	4.0	4.0	4.0	3.0	--
Fluoride[e]	mg/L	--	--	--	--	1.5
Hardness	mg/L	--	--	--	--	--
Iron and Manganese (sum)	mg/L	--	--	--	--	0.500
Iron, Total	mg/L	0.30	0.30	0.30	0.30	0.30

-- No applicable guideline or reference standard available

Note: All water quality and metals standards are presented in mg/L (ppm) to provide consistency in comparisons.

[a] Source: 6 NYCRR Parts 701–704; The most stringent applicable pathway (e.g., wildlife, aquatic, human health) values are reported.

[b] Gross alpha standard includes radium-226, but excludes radon and uranium; however WVDP results include these isotopes.

[c] Gross beta standard excludes strontium-90 and alpha emitters, however WVDP results include these isotopes.

[d] Beryllium standard for classes "B" and "C" are based on stream hardness values.

[e] Standards for these constituents vary according to stream location hardness values.

[f] Standards for cobalt, thallium, and vanadium are applicable to the acid-soluble fraction.

[g] Applies to the sum of those organic substances which have individual human health water source standards listed at 0.100 mg/L or less in 6 NYCRR Part 703.5

[h] pH shall not be lower than 6.5 or the pH of natural groundwater, whichever is lower, nor shall pH be greater than 8.5 or the pH of the natural groundwater, whichever is greater.

TABLE B-1B *(concluded)*
New York State Water Quality Standards and Guidelines[a]

New York Water Quality Standards and Guidelines [a]						
Parameter	***Units***	***Class A***	***Class B***	***Class C***	***Class D***	***Class GA***
Lead, Dissolved[e]	mg/L	--	--	--	--	--
Lead, Total	mg/L	0.050	--	--	--	0.025
Magnesium, Total	mg/L	35.0	--	--	--	35.0
Manganese, Total	mg/L	0.30	--	--	--	0.30
Mercury, Dissolved	mg/L	0.0000007	0.0000007	0.0000007	0.0000007	--
Mercury, Total	mg/L	0.0007	--	--	--	0.0007
Nickel, Dissolved[e]	mg/L	--	--	--	--	--
Nickel, Total	mg/L	0.10	--	--	--	0.10
Nitrate-N	mg/L	10.0	--	--	--	10.0
Nitrate + Nitrite	mg/L	10.0	10.0	10.0	10.0	10.0
Nitrite-N	mg/L	0.10	0.10	0.10	--	1.00
NPOC[g]	mg/L	0.10	--	--	--	--
Oil & Grease	mg/L	--	--	--	--	--
pH	SU	6.5–8.5[h]	6.5–8.5[h]	6.5–8.5[h]	6.0–9.5	6.5–8.5[h]
Potassium, Total	mg/L	--	--	--	--	--
Selenium, Dissolved	mg/L	0.0046	0.0046	0.0046	--	--
Selenium, Total	mg/L	0.01	--	--	--	0.01
Silver, Total	mg/L	0.05	--	--	--	0.05
Sodium, Total	mg/L	--	--	--	--	20.0
Solids, Settleable	mg/L	--	--	--	--	--
Solids, Total Dissolved	mg/L	500	500	500	--	500
Solids, Total Suspended	mg/L	--	--	--	--	--
Sulfate	mg/L	250	--	--	--	250
Sulfide (undissociated form)	mg/L	0.002	0.002	0.002	--	0.050 (as HS)
Surfactants (as LAS)	mg/L	0.04	0.04	0.04	--	--
Thallium, Total[f]	mg/L	0.0005	0.008	0.008	0.020	0.0005
Titanium, Total	mg/L	--	--	--	--	--
TOX (total organic halides)[g]	mg/L	0.10	--	--	--	--
Vanadium, Total[f]	mg/L	0.014	0.014	0.014	0.190	--
Zinc, Dissolved[e]	mg/L	--	--	--	--	--
Zinc, Total	mg/L	2.00	--	--	--	2.00

-- No applicable guideline or reference standard available

Note: All water quality and metals standards are presented in mg/L (ppm) to provide consistency in comparisons.

[a] Source: 6 NYCRR Parts 701–704; The most stringent applicable pathway (e.g., wildlife, aquatic, human health) values are reported.

[b] Gross alpha standard includes radium-226, but excludes radon and uranium; however WVDP results include these isotopes.

[c] Gross beta standard excludes strontium-90 and alpha emitters, however WVDP results include these isotopes.

[d] Beryllium standard for classes "B" and "C" are based on stream hardness values.

[e] Standards for these constituents vary according to stream location hardness values.

[f] Standards for cobalt, thallium, and vanadium are applicable to the acid-soluble fraction.

[g] Applies to the sum of those organic substances which have individual human health water source standards listed at 0.100 mg/L or less in 6 NYCRR Part 703.5

[h] pH shall not be lower than 6.5 or the pH of natural groundwater, whichever is lower, nor shall pH be greater than 8.5 or the pH of the natural groundwater, whichever is greater.

TABLE B-1C
New York State Department of Health/U.S. Environmental Protection Agency Potable Water MCLs, MCLGs, and Raw Water Standards

Parameter	*Units*	*NYSDOH or EPA MCL* [a]	*EPA MCLG* [b]	*NYSDOH Raw Water Standards* [c]
Gross Alpha	pCi/L (µCi/mL)	15 (1.5E-08)[d]	0	--
Gross Beta	pCi/L (µCi/mL)	50 (5E-08)[e]	0	1,000 (1E-06)
Tritium (H-3)	pCi/L (µCi/mL)	20,000 (2E-05)	--	--
Strontium-90	pCi/L (µCi/mL)	8 (8E-09)	--	10 (1E-08)
Antimony, Total	mg/L	0.006	0.006	--
Arsenic, Total	mg/L	0.05	--	0.05
Barium, Total	mg/L	2.00	2.00	1.0
Beryllium, Total	mg/L	0.004	0.004	--
Cadmium, Total	mg/L	0.005	0.005	0.01
Chromium, Total	mg/L	0.10	0.10	--
Conductivity	µmhos/cm@25°C	--	--	--
Copper, Total	mg/L	1.3	1.3	<0.2
Cyanide	mg/L	0.2	0.2	<0.1
E. Coli	NA	one positive sample	0	--
Fluoride	mg/L	2.2	--	<1.5
Free Residual Chlorine	mg/L	0.02 (min) 4.0 (max)	--	--
Haloacetic Acids-Five (5)	mg/L	0.060	--	--
Iron, Total	mg/L	0.3	--	--
Lead, Total	mg/L	0.015	0	0.05
Mercury, Total	mg/L	0.002	0.002	0.005
Nickel, Total	mg/L	--	--	--
Nitrate-N	mg/L	10	10	--
pH	SU	--	--	6.5–8.5
POC (Principle Organic Contaminant)	mg/L	--	0.0005	--
Selenium, Total	mg/L	0.05	0.05	0.01
Solids, Total Dissolved	mg/L	--	--	500
Thallium, Total	mg/L	0.002	0.0005	--
Total Coliform	NA	2 or more positive samples	0	--
Total Trihalomethanes	mg/L	0.080	--	--
Turbidity	NTU	1 (max)	--	

-- No applicable guideline or reference standard available

Note: All water quality and metals standards are presented in mg/L (ppm) to provide consistency in comparisons.

NA - Not applicable

[a] MCL - Listed is NYSDOH or EPA Maximum Contaminant Level. Sources: 40 CFR 141 and/or 5 NYCRR 5-1.52, whichever is more stringent.

[b] MCLG - Maximum Contaminant Level Goal (non-enforceable) as listed in 40 CFR Part 141

[c] Source: 10 NYCRR Part 170.4

[d] Alpha guideline includes radium-226, but excludes uranium; however, WVDP results include these isotopes.

[e] Average annual concentration assumed to produce a total body organ dose of 4 mrem/year

TABLE B-1D
U.S. Department of Energy Derived Concentration Guides (DCGs)[a] in Ingested Water

Radionuclide	*Units*	*Concentration in Ingested Water*
Gross Alpha (as Am-241)[b]	µCi/mL	3E-08
Gross Beta (as Sr-90)[b]	µCi/mL	1E-06
Tritium (H-3)	µCi/mL	2E-03
Carbon-14 (C-14)	µCi/mL	7E-05
Potassium-40 (K-40)	µCi/mL	7E-06
Cobalt-60 (Co-60)	µCi/mL	5E-06
Strontium-90 (Sr-90)	µCi/mL	1E-06
Technetium-99 (Tc-99)	µCi/mL	1E-04
Iodine-129 (I-129)	µCi/mL	5E-07
Cesium-137 (Cs-137)	µCi/mL	3E-06
Europium-154 (Eu-154)	µCi/mL	2E-05
Uranium-232 (U-232)	µCi/mL	1E-07
Uranium-233 (U-233)	µCi/mL	5E-07
Uranium-234 (U-234)	µCi/mL	5E-07
Uranium-235 (U-235)	µCi/mL	6E-07
Uranium-236 (U-236)	µCi/mL	5E-07
Uranium-238 (U-238)	µCi/mL	6E-07
Plutonium-238 (Pu-238)	µCi/mL	4E-08
Plutonium-239 (Pu-239)	µCi/mL	3E-08
Plutonium-240 (Pu-240)	µCi/mL	3E-08
Americium-241 (Am-241)	µCi/mL	3E-08

[a] DCG: Derived Concentration Guide. DCGs are established in DOE Order 5400.5 and are defined as the concentration of a radionuclide that, under conditions of continuous exposure for one year by one exposure mode, would result in an effective dose equivalent of 100 mrem (1mSv).

[b] Because there are no DCGs for gross alpha and gross beta concentrations, the DCGs for the most restrictive alpha and beta emitters at the WVDP, americium-241 and strontium-90 (3E-08 and 1E-06 µCi/mL, respectively) are used as a conservative basis for comparison at locations for which there are no radionuclide-specific data, in which case a more appropriate DCG may be applied.

APPENDIX B-2

Process Effluent Data

TABLE B-2A
Comparison of 2007 Lagoon 3 (WNSP001) Liquid Effluent Radioactivity Concentrations With U.S. Department of Energy Guidelines

Isotope [a]	*Discharge Activity* [b] *(Ci)*	*Radioactivity* [c] *(Becquerels)*	*Average Concentration (µCi/mL)*	*DCG* [d] *(µCi/mL)*	*Ratio of Concentration to DCG*
Gross Alpha	1.11±0.11E-03	4.12±0.40E+07	2.73±0.26E-08	NA[e]	NA
Gross Beta	1.01±0.02E-02	3.75±0.08E+08	2.49±0.05E-07	NA[e]	NA
H-3	5.27±0.14E-02	1.95±0.05E+09	1.29±0.03E-06	2E-3	0.0006
C-14	-0.52±5.73E-04	-0.19±2.12E+07	-0.13±1.41E-08	7E-5	<0.0002
K-40	-3.17±9.90E-04	-1.17±3.66E+07	-0.78±2.43E-08	NA[f]	NA
Co-60	4.61±3.41E-05	1.71±1.26E+06	1.13±0.84E-09	5E-6	0.0002
Sr-90	3.95±0.07E-03	1.46±0.03E+08	9.71±0.18E-08	1E-6	0.0971
Tc-99	5.68±0.43E-04	2.10±0.16E+07	1.40±0.11E-08	1E-4	0.0001
I-129	6.98±1.76E-05	2.58±0.65E+06	1.71±0.43E-09	5E-7	0.0034
Cs-137	2.42±0.10E-03	8.94±0.36E+07	5.94±0.24E-08	3E-6	0.0198
U-232[g]	2.63±0.10E-04	9.72±0.37E+06	6.46±0.24E-09	1E-7	0.0646
U-233/234[g]	1.72±0.08E-04	6.35±0.31E+06	4.22±0.21E-09	5E-7	0.0084
U-235/236[g]	1.10±0.21E-05	4.08±0.78E+05	2.71±0.52E-10	5E-7[h]	0.0005
U-238[g]	1.57±0.08E-04	5.82±0.30E+06	3.86±0.20E-09	6E-7	0.0064
Pu-238	1.53±0.72E-06	5.66±2.67E+04	3.76±1.77E-11	4E-8	0.0009
Pu-239/240	1.40±0.68E-06	5.19±2.53E+04	3.45±1.68E-11	3E-8	0.0012
Am-241	1.94±0.83E-06	7.17±3.08E+04	4.76±2.05E-11	3E-8	0.0016
Sum of Ratios					**0.205**

NA - Not applicable

[a] Half-lives are listed in Table UI-4.

[b] Total volume released: 4.07E+10 mL (1.08E+07 gal)

[c] 1 curie (Ci) = 3.7E+10 becquerels (Bq); 1Bq = 2.7E-11 Ci

[d] DOE-derived concentration guides (DCGs) are listed for reference only. DCGs are applicable at the point at which water is available for ingestion by the public (i.e., at the site boundary), but not to release point concentrations, as might be inferred from their inclusion in this table.

[e] DOE DCGs do not exist for indicator parameteres gross alpha and gross beta.

[f] The DCG is not applied to potassium-40 (K-40) activity because of its natural origin.

[g] Total U (g) = 4.70±0.05E+02; Average U (µg/mL) = 1.15±0.01E-02

[h] DCG for U-236 is used for this comparison.

TABLE B-2B
2007 SPDES Results for Outfall 001 (WNSP001): Water Quality

Permit Limit	Ammonia (mg/L) Monitor		BOD $_5$ day (mg/L) 10.0 mg/L daily maximum		Discharge Rate (MGD) Monitor		Nitrate (as N) (mg/L) Monitor	
Month	**Avg**	**Max**	**Avg**	**Max**	**Avg**	**Max**	**Avg**	**Max**
January	0.040	0.053	<2.0	2.0	0.313	0.371	0.50	0.51
February	0.066	0.074	<2.0	<2.0	0.306	0.339	0.97	1.0
March [a]	--	--	--	--	--	--	--	--
April	<0.011	<0.011	<2.0	<2.0	0.303	0.329	0.91	1.0
May [a]	--	--	--	--	--	--	--	--
June	<0.016	0.020	<2.1	2.1	0.151	0.175	<0.034	0.057
July [a]	--	--	--	--	--	--	--	--
August	<0.017	0.022	<2.3	2.6	0.119	0.178	<0.011	<0.011
September [a]	--	--	--	--	--	--	--	--
October	<0.051	0.090	2.8	2.9	0.127	0.175	<0.011	<0.011
November [a]	--	--	--	--	--	--	--	--
December [a]	--	--	--	--	--	--	--	--

Permit Limit	Nitrite (as N) (mg/L) 0.1 mg/L daily maximum		Oil & Grease (mg/L) 15.0 mg/L daily maximum		pH (standard units) 6.5 to 8.5		Solids, Settleable (ml/L) 0.3 ml/L daily maximum	
Month	**Avg**	**Max**	**Avg**	**Max**	**Min**	**Max**	**Avg**	**Max**
January	<0.02	<0.02	<2.2	<2.2	7.6	7.6	<0.1	<0.1
February	<0.02	<0.02	<2.2	<2.2	7.2	7.2	<0.1	<0.1
March [a]	--	--	--	--	--	--	--	--
April	<0.02	<0.02	<2.2	<2.2	7.3	7.3	<0.1	<0.1
May [a]	--	--	--	--	--	--	--	--
June	<0.02	<0.02	<2.2	<2.2	7.7	7.7	<0.1	<0.1
July [a]	--	--	--	--	--	--	--	--
August	<0.02	<0.02	<2.2	<2.2	7.4	7.4	<0.1	<0.1
September [a]	--	--	--	--	--	--	--	--
October	<0.02	<0.02	<3.2	4.2	7.7	7.7	<0.1	<0.1
November [a]	--	--	--	--	--	--	--	--
December [a]	--	--	--	--	--	--	--	--

Note: No results exceeded the permit limits.

[a] No discharge this month

TABLE B-2B *(concluded)*
2007 SPDES Results for Outfall 001 (WNSP001): Water Quality

Permit Limit	***Solids, Total Dissolved (mg/L)*** ***Monitor***		***Solids, Total Suspended (mg/L)*** ***45 mg/L daily maximum; 30 mg/L daily average***		***Sulfate (as S) (mg/L)*** ***Monitor***		***Sulfide (as S) Dissolved (mg/L)*** ***0.4 mg/L daily maximum***	
Month	**Avg**	**Max**	**Avg**	**Max**	**Avg**	**Max**	**Avg**	**Max**
January	745	761	<4.0	<4.0	39	40	<0.02	<0.02
February	774	782	<4.0	<4.0	43	45	<0.02	<0.02
March [a]	--	--	--	--	--	--	--	--
April	785	792	<4.0	<4.0	45	47	<0.02	<0.02
May [a]	--	--	--	--	--	--	--	--
June	942	966	<4.0	<4.0	72	81	<0.02	<0.02
July [a]	--	--	--	--	--	--	--	--
August	1,114	1,119	<4.0	<4.0	81	102	<0.02	<0.02
September [a]	--	--	--	--	--	--	--	--
October	1,151	1,193	<4.4	4.8	74	92	0.04	0.04
November [a]	--	--	--	--	--	--	--	--
December [a]	--	--	--	--	--	--	--	--

Note: No results exceeded the permit limits.

[a] No discharge this month

TABLE B-2C
2007 SPDES Results for Outfall 001 (WNSP001): Metals

Permit Limit	***Aluminum Total (mg/L)* 14.0 mg/L daily maximum; 7.0 mg/L daily average**		***Arsenic Dissolved (mg/L)* 0.15 mg/L daily maximum**		***Cobalt Total Recoverable (mg/L)* 0.005 mg/L daily maximum**		***Iron Total (mg/L)* Monitor**	
Month	***Avg***	***Max***	***Avg***	***Max***	***Avg***	***Max***	***Avg***	***Max***
January	0.266	0.266	0.0012	0.0012	<0.0008	<0.0008	0.277	0.346
February	0.126	0.126	0.0012	0.0012	<0.0008	<0.0008	0.202	0.232
March [a]	--	--	--	--	--	--	--	--
April	0.185	0.185	0.0017	0.0017	<0.0009	<0.0009	0.200	0.250
May [a]	--	--	--	--	--	--	--	--
June	0.110	0.110	0.003	0.003	<0.0009	<0.0009	0.0941	0.109
July [a]	--	--	--	--	--	--	--	--
August	0.138	0.165	0.0033	0.0033	<0.0009	<0.0009	0.222	0.230
September [a]	--	--	--	--	--	--	--	--
October	0.411	0.411	0.0032	0.0032	<0.0009	<0.0009	0.575	0.819
November [a]	--	--	--	--	--	--	--	--
December [a]	--	--	--	--	--	--	--	--

Permit Limit	***Mercury, Total (per EPA Method 1631) (ng/L)* 200 ng/L daily maximum**		***Selenium Total Recoverable (mg/L)* 0.004 mg/L daily maximum**		***Vanadium Total Recoverable (mg/L)* 0.014 mg/L daily maximum**	
Month	***Avg***	***Max***	***Avg***	***Max***	***Avg***	***Max***
January	3.17	3.29	<0.0004	<0.0004	<0.00098	<0.00098
February	4.57	4.92	<0.0004	<0.0004	<0.00098	<0.00098
March [a]	--	--	--	--	--	--
April	3.20	3.64	<0.0004	<0.0004	<0.00078	<0.00078
May [a]	--	--	--	--	--	--
June	2.66	2.88	0.001	0.001	<0.00078	<0.00078
July [a]	--	--	--	--	--	--
August	2.24	2.41	0.0009	0.001	<0.00078	<0.00078
September [a]	--	--	--	--	--	--
October	8.09	8.98	<0.001	0.002	0.001	0.001
November [a]	--	--	--	--	--	--
December [a]	--	--	--	--	--	--

Note: No results exceeded the permit limits.

[a] No discharge this month

TABLE B-2D
2007 SPDES Results for Outfall 007 (WNSP007): Water Quality and Iron

Permit Limit	Ammonia (as NH_3) (mg/L) Monitor		BOD_5 (mg/L) 10.0 mg/L daily maximum		Chlorine Total Residual (mg/L) 0.1 mg/L daily maximum		Discharge Rate (MGD) Monitor		Iron Total (mg/L) Monitor	
Month	**Avg**	**Max**	**Avg**	**Max**	**Avg**	**Max**	**Avg**	**Max**	**Avg**	**Max**
January	<0.011	<0.011	<2.0	<2.0	0.02	0.03	0.013	0.017	0.105	0.122
February	<0.019	0.026	<2.0	<2.0	<0.01	0.02	0.017	0.020	0.177	0.200
March	<0.016	0.021	<2.0	<2.0	0.02	0.03	0.010	0.012	0.101	0.151
April	<0.022	0.027	<2.7	4.2	0.02	0.04	0.009	0.014	0.135	0.165
May	<0.019	0.031	<2.0	<2.0	<0.01	0.01	0.007	0.020	0.109	0.165
June	<0.012	0.014	<2.1	2.2	<0.01	0.01	0.005	0.008	0.061	0.090
July	<0.017	0.030	<2.3	2.9	0.01	0.02	0.006	0.013	0.0485	0.0579
August	<0.021	0.036	<2.1	2.2	0.01	0.02	0.006	0.012	0.0380	0.0501
September	0.031	0.037	<2.0	<2.0	<0.02	0.02	0.006	0.014	0.0355	0.0432
October	<0.012	0.015	<2.1	2.3	<0.02	0.02	0.007	0.015	0.037	0.048
November	<0.014	0.021	<2.0	<2.0	0.02	0.03	0.008	0.017	0.0701	0.116
December	<0.022	0.044	<2.4	3.2	0.02	0.02	0.0088	0.0094	0.11	0.14

Permit Limit	Nitrite (as N) (mg/L) 0.1 mg/L daily maximum		Oil & Grease (mg/L) 15.0 mg/L daily maximum		pH (standard units) 6.5 to 8.5		Solids Settleable (mL/L) 0.3 mL/L daily maximum		Solids Total Suspended (mg/L) 45 mg/L daily maximum; 30 mg/L daily average	
Month	**Avg**	**Max**	**Avg**	**Max**	**Min**	**Max**	**Avg**	**Max**	**Avg**	**Max**
January	<0.02	<0.02	<2.2	<2.2	7.0	7.9	<0.1	<0.1	<4.0	<4.0
February	<0.02	<0.02	<2.7	3.6	7.2	7.7	<0.1	<0.1	<4.0	<4.0
March	<0.02	<0.02	<2.2	<2.2	7.2	7.9	<0.1	<0.1	<4.0	<4.0
April	<0.02	<0.02	<2.2	<2.2	7.3	7.8	<0.1	<0.1	<5.3	8.0
May	<0.02	<0.02	<2.2	<2.2	7.0	7.5	<0.1	<0.1	<4.0	<4.0
June	<0.02	<0.02	<2.2	<2.2	7.4	7.7	<0.1	<0.1	<4.0	<4.0
July	<0.02	<0.02	<2.2	<2.2	7.2	7.8	<0.1	<0.1	<4.0	<4.0
August	<0.02	<0.02	<2.2	<2.2	7.5	7.8	<0.1	<0.1	<4.0	<4.0
September	<0.02	<0.02	<2.2	<2.2	7.3	7.9	<0.1	<0.1	<4.3	4.8
October	<0.02	<0.02	<2.2	<2.2	7.6	8.0	<0.1	<0.1	<4.0	<4.0
November	<0.02	<0.02	<2.6	3.5	7.6	8.5	<0.1	<0.1	<6.7	12
December	<0.02	<0.02	<2.2	<2.2	7.6	8.0	<0.1	<0.1	<7.5	14

Note: No results exceeded the permit limits.

TABLE B-2E
2007 SPDES Results for Sums of Outfalls 001, 007, 008, and 116: Water Quality

2007 Results for Sums of Outfalls 001, 007 and 008

Permit Limit	Ammonia [a] Flow-Weighted 1.49 mg/L daily average	2.1 mg/L daily maximum	BOD $_5$ day 5.0 mg/L daily average		Iron Total Flow-Weighted 0.30 mg/L daily maximum	
Month	**Avg**	**Max**	**Avg**	**Max**	**Avg**	**Max**
January	<0.029	<0.051	<2.0	<2.0	0.00	0.00
February	<0.046	0.071	<2.0	<2.0	0.00	0.00
March	<0.016	0.021	<2.0	<2.0	0.00	0.00
April	<0.016	0.027	<2.0	<2.0	0.00	0.00
May	<0.019	0.031	<2.0	<2.0	0.00	0.00
June	<0.015	<0.020	<2.1	2.2	0.00	0.00
July	<0.017	0.030	<2.3	2.9	0.00	0.00
August	<0.017	0.023	<2.2	2.6	0.00	0.00
September	0.031	0.037	<2.0	<2.0	0.00	0.00
October	<0.035	<0.082	<2.5	<2.8	0.00	0.00
November	<0.014	0.021	<2.0	<2.0	0.00	0.00
December	<0.022	0.044	<2.4	3.2	0.00	0.00

2007 Results for Outfall 116

Permit Limit	Total Dissolved Solids (mg/L) 500 mg/L daily maximum	
Month	**Avg**	**Max**
January	337	361
February	381	385
March [b]	--	--
April	322	374
May [b]	--	--
June	349	354
July [b]	--	--
August	346	355
September [b]	--	--
October	382	399
November [b]	--	--
December [b]	--	--

Note: No results exceeded the permit limits.

[a] Sum of Outfalls 001 and 007 only

[b] No discharge this month

TABLE B-2F
2007 Annual, Semiannual, and Quarterly SPDES Results for Outfall 001: Metals, Organics, and Water Quality

Permit Limit Parameters	*Permit Limit*	*Monitoring Frequency*	*Collection Date*	*Maximum Measured (mg/L)*
2-Butanone	0.5 mg/L daily maximum	Annual	January 2008	<0.005
3,3-Dichlorobenzidine	0.01 mg/L daily maximum	Annual	January 2008	<0.00008
Alpha-BHC	0.00001 mg/L daily maximum	Annual	January 2008	<0.000004
Cadmium, Total Recoverable	0.002 mg/L daily maximum	Annual	January 2008	<0.0004
Chromium VI, Total Recoverable	0.011 mg/L daily maximum	Annual	January 2008	<0.008
Chromium, Total Recoverable	0.3 mg/L daily maximum	Semiannual	July 2007 January 2008	<0.0007 0.01
Copper, Dissolved	Monitor	Semiannual	July 2007 January 2008	0.0039 0.0060
Copper, Total Recoverable	0.030 mg/L daily maximum	Semiannual	July 2007 January 2008	0.0029 0.0038
Cyanide, Amenable to chlorination	0.022 mg/L daily maximum	Semiannual	July 2007 January 2008	<0.0030 <0.0030
Dichlorodifluoromethane	0.01 mg/L daily maximum	Annual	January 2008	<0.002
Heptachlor	0.00001 mg/L daily maximum	Semiannual	July 2007 January 2008	<0.000005 <0.000008
Hexachlorobenzene	0.02 mg/L daily maximum	Annual	January 2008	<0.00006
Lead, Total Recoverable	0.006 mg/L daily maximum	Quarterly	April 2007 July 2007 October 2007 January 2008	0.0003 0.0003 0.0004 0.0005
Manganese, Total	2.0 mg/L daily maximum	Semiannual	July 2007 January 2008	0.063 0.052
Nickel, Total Recoverable	0.14 mg/L daily maximum	Semiannual	July 2007 January 2008	<0.0014 0.064
Surfactant as LAS	0.4 mg/L daily minimum	Semiannual	July 2007 January 2008	0.08 0.03
Tributyl phosphate	32 mg/L daily maximum	Annual	January 2008	<0.00083
Trichlorofluoromethane	0.01 mg/L daily maximum	Annual	January 2008	<0.002
Xylene	0.05 mg/L daily maximum	Annual	January 2008	<0.007
Zinc, Total Recoverable	0.48 mg/L daily maximum	Semiannual	July 2007 January 2008	0.0098 0.0054

TABLE B-2G
2007 SPDES Action Level Requirement Monitoring Results for Outfalls 001, 007, and 008: Metals, Organics, and Water Quality

Outfall	*Action Level Parameters*	*Action Level*	*Monitoring Frequency*	*Collection Date*	*Maximum Measured (mg/L)*
001	**Antimony, Total**	1.0 mg/L daily maximum	Annual	January 2008	<0.0056
	Barium, Total	0.5 mg/L daily maximum	Annual	January 2008	0.01
	Boron, Total	2.0 mg/L daily maximum	Quarterly	April 2007 July 2007 October 2007 January 2008	0.033 0.039 0.059 0.036
	Bromide, Total	5.0 mg/L daily maximum	Quarterly	April 2007 July 2007 October 2007 January 2008	1.2 1.5 1.9 1.2
	Chloroform	0.3 mg/L daily maximum	Annual	January 2008	<0.0009
	Titanium	0.65 mg/L daily maximum	Semiannual	July 2007 January 2008	0.0022 0.0081
007	**Chloroform**	0.20 mg/L daily maximum	Annual	January 2008	<0.00089
008	**Arsenic, Total**	0.17 mg/L daily maximum	Annual	[a]	--
	Chromium, Total	0.13 mg/L daily maximum	Annual	[a]	--
	Silver, Total	0.008 mg/L daily maximum	Annual	[a]	--
	Zinc, Total	0.1 mg/L daily maximum	Annual	[a]	--

[a] No discharge at this outfall, drainage pipe was capped in May 2001.

TABLE B-2H
2007 SPDES Results for Outfall 01B (WNSP01B): Water Quality

Internal process monitoring point did not operate during 2007

TABLE B-2I
2007 SPDES Results for Outfall 008 (WNSP008): Water Quality

No discharge; Drainage pipe capped in May 2001

TABLE B-2J
2007 Results for Sewage Treatment Outfall (WNSP007)

Isotope [a]	*N*	*Discharge Activity* [b] *(Ci)*	*Radioactivity* [c] *Becquerels*	*Average Concentration (µCi/mL)*	*DCG (µCi/mL)*	*% of DCG*
Gross Alpha	23	-0.05±2.35E-05	-0.19±8.70E+05	-0.04±2.01E-09	NA[d]	NA
Gross Beta	23	1.14±0.25E-04	4.23±0.91E+05	9.76±2.11E-09	NA[d]	NA
Tritium	23	2.01±2.58E-04	7.42±9.54E+06	1.72±2.20E-08	2E-03	<0.01%
Sr-90	2	0.39±7.17E-06	0.15±2.65E+05	0.34±6.13E-10	1E-06	<0.06%
Cs-137	2	0.03±1.61E-05	0.10±5.96E+05	0.02±1.38E-09	3E-06	<0.05%
Total % DCG						<0.11%

N - Number of samples
NA - Not applicable
[a] Half-lives are listed in Table UI-4.
[b] Total volume released; 1.17E+10 mL (3.09E+06 gal)
[c] 1 curie (Ci) = 3.7E+10 becquerels (Bq); 1 Bq = 2.7E-11 Ci
[d] DOE derived concentration guides (DCGs) do not exist for indicator parameters gross alpha and beta.

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APPENDIX B-3

SPDES-Permitted Storm Water Outfall Discharge Data

TABLE B-3A
2007 Storm Water Discharge Monitoring Data for Outfall Group 1

Storm Water Outfall S04

Analyte	*Units*	*N*	*First Flush Grab*	*Flow-weighted Composite*
			4/25/07	*4/25/07*
Aluminum, Total	mg/L	2	4.12	9.18
Ammonia (as NH_3)	mg/L	2	0.034	0.025
BOD_5	mg/L	2	<2.0	2.4
Cadmium, Total Recoverable	mg/L	2	<0.00018	<0.00018
Chromium, Total Recoverable	mg/L	2	0.0108	0.0120
Chromium, Hexavalent, Total Recoverable	mg/L	2	<0.008	<0.008
Copper, Total Recoverable	mg/L	2	0.0215	0.0170
Iron, Total	mg/L	2	7.1	13.5
Lead, Total Recoverable	mg/L	2	0.0107	0.0088
Nitrogen, Nitrate (as N)	mg/L	2	1.3	0.41
Nitrogen, Nitrite (as N)	mg/L	2	<0.020	<0.020
Nitrogen, Total (as N)	mg/L	2	<1.6	<0.53
Nitrogen, Total Kjeldahl	mg/L	2	0.28	0.10
Oil & Grease[a]	mg/L	1	<2.2	NR
pH[b]	SU	1	7.79	NR
Phosphorous, Total	mg/L	2	0.20	0.22
Selenium, Total Recoverable	mg/L	2	<0.0022	<0.0022
Solids, Total Dissolved	mg/L	2	1970	397
Solids, Total Suspended	mg/L	2	143	179
Vanadium, Total Recoverable	mg/L	2	0.0165	0.0179
Zinc, Total Recoverable	mg/L	2	0.123	0.103
Rain Event Summary				
pH of Rainfall During Sampling Event	SU	1	7.41	
Rainfall During Sampling Event	inches	--	0.23	
Total Flow During Sampling Event	gallons	--	226,556	
Maximum Flow Rate During Sampling Event	gpm	--	1,752	

N - Number of samples
NR - Not required by permit
[a] The SPDES permit specifies that oil and grease concentrations shall not exceed 15 mg/L.
[b] The SPDES permit specifies that pH shall not be less than the measured pH of rainfall collected from the site rain gauge at WNSWR01 during storm water discharge sampling or 6.0 SU, whichever is less, and the pH shall not exceed 9.0.

TABLE B-3A *(concluded)*
2007 Storm Water Discharge Monitoring Data for Outfall Group 1

Storm Water Outfall S04

Analyte	*Units*	*N*	*First Flush Grab*	*Flow-weighted Composite*
			7/11/07	*7/11/07*
Aluminum, Total	mg/L	2	5.5	6.1
Ammonia (as NH_3)	mg/L	2	0.20	0.021
BOD_5	mg/L	2	19	3.6
Cadmium, Total Recoverable	mg/L	2	0.00010	0.00019
Chromium, Total Recoverable	mg/L	2	0.0077	0.0069
Chromium, Hexavalent, Total Recoverable	mg/L	2	<0.008	<0.008
Copper, Total Recoverable	mg/L	2	0.012	0.0080
Iron, Total	mg/L	2	7.0	6.4
Lead, Total Recoverable	mg/L	2	0.0068	0.0086
Nitrogen, Nitrate (as N)	mg/L	2	1.0	0.30
Nitrogen, Nitrite (as N)	mg/L	2	<0.020	<0.020
Nitrogen, Total (as N)	mg/L	2	<2.0	<0.64
Nitrogen, Total Kjeldahl	mg/L	2	0.97	0.32
Oil & Grease[a]	mg/L	1	<2.2	NR
pH[b]	SU	1	8.40	NR
Phosphorous, Total	mg/L	2	0.20	0.13
Selenium, Total Recoverable	mg/L	2	0.00060	0.00056
Solids, Total Dissolved	mg/L	2	340	90
Solids, Total Suspended	mg/L	2	200	150
Vanadium, Total Recoverable	mg/L	2	0.0092	0.0077
Zinc, Total Recoverable	mg/L	2	0.085	0.056
Rain Event Summary				
pH of Rainfall During Sampling Event	SU	1	7.01	
Rainfall During Sampling Event	inches	--	0.94	
Total Flow During Sampling Event	gallons	--	1,300,000	
Maximum Flow Rate During Sampling Event	gpm	--	23,000	

N - Number of samples
NR - Not required by permit
[a] The SPDES permit specifies that oil and grease concentrations shall not exceed 15 mg/L.
[b] The SPDES permit specifies that pH shall not be less than the measured pH of rainfall collected from the site rain gauge at WNSWR01 during storm water discharge sampling or 6.0 SU, whichever is less, and the pH shall not exceed 9.0.

TABLE B-3B
2007 Storm Water Discharge Monitoring Data for Outfall Group 2

Storm Water Outfall S06

Analyte	Units	N	First Flush Grab	Flow-weighted Composite
			5/10/07	5/10/07
Aluminum, Total	mg/L	2	<0.068	<0.068
BOD_5	mg/L	2	3.8	2.7
Copper, Total Recoverable	mg/L	2	0.000618	0.000566
Iron, Total	mg/L	2	0.0975	0.0537
Lead, Total Recoverable	mg/L	2	<0.0005	<0.0005
Oil & Grease[a]	mg/L	1	1.0	NR
pH[b]	SU	1	7.32	NR
Phosphorous, Total	mg/L	2	0.048	0.048
Solids, Total Dissolved	mg/L	2	901	980
Solids, Total Suspended	mg/L	2	1.6	1.4
Surfactant	mg/L	2	<0.030	0.0752
Zinc, Total Recoverable	mg/L	2	0.00610	0.00331
Rain Event Summary				
pH of Rainfall During Sampling Event	SU	1	4.24	
Rainfall During Sampling Event	inches	--	0.14	
Total Flow During Sampling Event	gallons	--	9,619	
Maximum Flow Rate During Sampling Event	gpm	--	1,276	

N - Number of samples

NR - Not required by permit

[a] The SPDES permit specifies that oil and grease concentrations shall not exceed 15 mg/L.

[b] The SPDES permit specifies that pH shall not be less than the measured pH of rainfall collected from the site rain gauge at WNSWR01 during storm water discharge sampling or 6.0 SU, whichever is less, and the pH shall not exceed 9.0.

TABLE B-3B *(concluded)*
2007 Storm Water Discharge Monitoring Data for Outfall Group 2

Storm Water Outfall S33

Analyte	*Units*	*N*	*First Flush Grab*	*Flow-weighted Composite*
			7/11/07	*7/11/07*
Aluminum, Total	mg/L	2	8.9	2.1
BOD_5	mg/L	2	10	4.1
Copper, Total Recoverable	mg/L	2	0.0093	0.0038
Iron, Total	mg/L	2	27	4.2
Lead, Total Recoverable	mg/L	2	0.030	0.0075
Oil & Grease[a]	mg/L	1	<2.2	NR
pH[b]	SU	1	7.50	NR
Phosphorous, Total	mg/L	2	0.60	0.15
Solids, Total Dissolved	mg/L	2	180	460
Solids, Total Suspended	mg/L	2	380	96
Surfactant	mg/L	2	<0.013	<0.013
Zinc, Total Recoverable	mg/L	2	0.081	0.041
Rain Event Summary				
pH of Rainfall During Sampling Event	SU	1	7.01	
Rainfall During Sampling Event	inches	--	0.94	
Total Flow During Sampling Event	gallons	--	4,700	
Maximum Flow Rate During Sampling Event	gpm	--	59	

N - Number of samples

NR - Not required by permit

[a] The SPDES permit specifies that oil and grease concentrations shall not exceed 15 mg/L.

[b] The SPDES permit specifies that pH shall not be less than the measured pH of rainfall collected from the site rain gauge at WNSWR01 during storm water discharge sampling or 6.0 SU, whichever is less, and the pH shall not exceed 9.0.

TABLE B-3C
2007 Storm Water Discharge Monitoring Data for Outfall Group 3

Storm Water Outfall S12

Analyte	*Units*	*N*	*First Flush Grab*	*Flow-weighted Composite*
			5/10/07	*5/10/07*
Alpha-BHC	mg/L	2	<0.000011	<0.000011
Aluminum, Total	mg/L	2	9.01	9.44
Ammonia (as NH_3)	mg/L	2	0.14	0.20
BOD_5	mg/L	2	<16.3	12.3
Copper, Total Recoverable	mg/L	2	0.0247	0.0294
Iron, Total	mg/L	2	19.4	15.4
Lead, Total Recoverable	mg/L	2	0.0102	0.0102
Nitrogen, Nitrate (as N)	mg/L	2	0.64	1.10
Nitrogen, Nitrite (as N)	mg/L	2	<0.020	<0.020
Nitrogen, Total (as N)	mg/L	2	<2.16	<2.42
Nitrogen, Total Kjeldahl	mg/L	2	1.5	1.3
Oil & Grease[a]	mg/L	1	4.2	NR
pH[b]	SU	1	7.16	NR
Phosphorous, Total	mg/L	2	0.64	0.20
Solids, Total Dissolved	mg/L	2	553	579
Solids, Total Suspended	mg/L	2	322	275
Zinc, Total Recoverable	mg/L	2	0.121	0.127
Rain Event Summary				
pH of Rainfall During Sampling Event	SU	1	4.24	
Rainfall During Sampling Event	inches	--	0.14	
Total Flow During Sampling Event	gallons	--	4,728	
Maximum Flow Rate During Sampling Event	gpm	--	156	

N - Number of samples
NR - Not required by permit
[a] The SPDES permit specifies that oil and grease concentrations shall not exceed 15 mg/L.
[b] The SPDES permit specifies that pH shall not be less than the measured pH of rainfall collected from the site rain gauge at WNSWR01 during storm water discharge sampling or 6.0 SU, whichever is less, and the pH shall not exceed 9.0.

TABLE B-3C *(continued)*
2007 Storm Water Discharge Monitoring Data for Outfall Group 3

Storm Water Outfall S09

Analyte	*Units*	*N*	*First Flush Grab*	*Flow-weighted Composite*
			5/16/07	*5/16/07*
Alpha-BHC	mg/L	2	<0.000011	<0.000011
Aluminum, Total	mg/L	2	11.6	16.9
Ammonia (as NH_3)	mg/L	2	0.26	0.37
BOD_5	mg/L	2	3.4	3.9
Copper, Total Recoverable	mg/L	2	0.0157	0.0205
Iron, Total	mg/L	2	13.4	20.3
Lead, Total Recoverable	mg/L	2	0.0765	0.0653
Nitrogen, Nitrate (as N)	mg/L	2	0.63	0.77
Nitrogen, Nitrite (as N)	mg/L	2	<0.020	<0.020
Nitrogen, Total (as N)	mg/L	2	<1.61	<1.63
Nitrogen, Total Kjeldahl	mg/L	2	0.96	0.84
Oil & Grease[a]	mg/L	1	<2.2	NR
pH[b]	SU	1	7.58	NR
Phosphorous, Total	mg/L	2	0.29	0.31
Solids, Total Dissolved	mg/L	2	204	203
Solids, Total Suspended	mg/L	2	136	481
Zinc, Total Recoverable	mg/L	2	0.152	0.164
Rain Event Summary				
pH of Rainfall During Sampling Event	SU	1	7.55	
Rainfall During Sampling Event	inches	--	0.43	
Total Flow During Sampling Event	gallons	--	246	
Maximum Flow Rate During Sampling Event	gpm	--	7.6	

N - Number of samples

NR - Not required by permit

[a] The SPDES permit specifies that oil and grease concentrations shall not exceed 15 mg/L.

[b] The SPDES permit specifies that pH shall not be less than the measured pH of rainfall collected from the site rain gauge at WNSWR01 during storm water discharge sampling or 6.0 SU, whichever is less, and the pH shall not exceed 9.0.

TABLE B-3C *(concluded)*
2007 Storm Water Discharge Monitoring Data for Outfall Group 3

Storm Water Outfall S12

Analyte	*Units*	*N*	*First Flush Grab*	*Flow-weighted Composite*
			10/2/07	*10/2/07*
Alpha-BHC	mg/L	2	<0.0000066	<0.0000066
Aluminum, Total	mg/L	2	1.1	1.9
Ammonia (as NH_3)	mg/L	2	<0.011	<0.011
BOD_5	mg/L	2	<2.0	3.6
Copper, Total Recoverable	mg/L	2	0.0061	0.0057
Iron, Total	mg/L	2	2.0	2.5
Lead, Total Recoverable	mg/L	2	0.0017	0.0021
Nitrogen, Nitrate (as N)	mg/L	2	0.028	0.36
Nitrogen, Nitrite (as N)	mg/L	2	<0.020	<0.020
Nitrogen, Total (as N)	mg/L	2	<0.51	<0.85
Nitrogen, Total Kjeldhal	mg/L	2	0.46	0.47
Oil & Grease[a]	mg/L	1	<2.2	NR
pH[b]	SU	1	7.4	NR
Phosphorous, Total	mg/L	2	0.077	0.31
Solids, Total Dissolved	mg/L	2	500	290
Solids, Total Suspended	mg/L	2	110	51
Zinc, Total Recoverable	mg/L	2	0.056	0.038
Rain Event Summary				
pH of Rainfall During Sampling Event	SU	1	4.47	
Rainfall During Sampling Event	inches	--	0.25	
Total Flow During Sampling Event	gallons	--	7,600	
Maximum Flow Rate During Sampling Event	gpm	--	88	

N - Number of samples

NR - Not required by permit

[a] The SPDES permit specifies that oil and grease concentrations shall not exceed 15 mg/L.

[b] The SPDES permit specifies that pH shall not be less than the measured pH of rainfall collected from the site rain gauge at WNSWR01 during storm water discharge sampling or 6.0 SU, whichever is less, and the pH shall not exceed 9.0.

TABLE B-3D
2007 Storm Water Discharge Monitoring Data for Outfall Group 4

Storm Water Outfall S34

Analyte	*Units*	*N*	*First Flush Grab*	*Flow-weighted Composite*
			4/4/07	*4/4/07*
Aluminum, Total	mg/L	2	41.5 / 38.8	16.0
BOD_5	mg/L	2	3.7 / 3.7	<2.0
Copper, Total Recoverable	mg/L	2	0.0649 / 0.116	0.0338
Iron, Total	mg/L	2	71.3 / 73.0	23.0
Lead, Total Recoverable	mg/L	2	0.0458 / 0.0443	0.0161
Oil & Grease[a]	mg/L	1	3.8 / 5.2	NR
pH[b]	SU	2	7.58 / 7.59	NR
Phosphorous, Total	mg/L	2	0.62 / 0.61	0.20
Solids, Total Dissolved	mg/L	2	463 / 431	361
Solids, Total Suspended	mg/L	2	1340 / 1220	419
Surfactant	mg/L	2	<0.013 / <0.013	<0.013
Zinc, Total Recoverable	mg/L	2	0.197 / 0.192	0.122
Rain Event Summary				
pH of Rainfall During Sampling Event	SU	1	6.51	
Rainfall During Sampling Event	inches	--	0.12	
Total Flow During Sampling Event	gallons	--	18,136	
Maximum Flow Rate During Sampling Event	gpm	--	285	

Note: The first flush grab samples were sampled and analyzed in duplicate.
N - Number of samples
NR - Not required by permit
[a] The SPDES permit specifies that oil and grease concentrations shall not exceed 15 mg/L.
[b] The SPDES permit specifies that pH shall not be less than the measured pH of rainfall collected from the site rain gauge at WNSWR01 during storm water discharge sampling or 6.0 SU, whichever is less, and the pH shall not exceed 9.0.

TABLE B-3D *(concluded)*
2007 Storm Water Discharge Monitoring Data for Outfall Group 4

Storm Water Outfall S34

Analyte	*Units*	*N*	*First Flush Grab*	*Flow-weighted Composite*
			7/11/07	*7/11/07*
Aluminum, Total	mg/L	2	12	5.6
BOD_5	mg/L	2	16	4.0
Copper, Total Recoverable	mg/L	2	0.023	0.0083
Iron, Total	mg/L	2	18	6.5
Lead, Total Recoverable	mg/L	2	0.014	0.0062
Oil & Grease[a]	mg/L	1	3.8	NR
pH[b]	SU	1	7.7	NR
Phosphorous, Total	mg/L	2	0.30	0.13
Solids, Total Dissolved	mg/L	2	280	130
Solids, Total Suspended	mg/L	2	500	170
Surfactant	mg/L	2	0.18	0.019
Zinc, Total Recoverable	mg/L	2	0.19	0.079
Rain Event Summary				
pH of Rainfall During Sampling Event	SU	1	7.01	
Rainfall During Sampling Event	inches	--	0.94	
Total Flow During Sampling Event	gallons	--	1,800,000	
Maximum Flow Rate During Sampling Event	gpm	--	27,000	

N - Number of samples
NR - Not required by permit
[a] The SPDES permit specifies that oil and grease concentrations shall not exceed 15 mg/L.
[b] The SPDES permit specifies that pH shall not be less than the measured pH of rainfall collected from the site rain gauge at WNSWR01 during storm water discharge sampling or 6.0 SU, whichever is less, and the pH shall not exceed 9.0.

TABLE B-3E
2007 Storm Water Discharge Monitoring Data for Outfall Group 5

Storm Water Outfall S14

Analyte	*Units*	*N*	*First Flush Grab*	*Flow-weighted Composite*
			4/25/07	*4/25/07*
Aluminum, Total	mg/L	2	0.156	0.357
Ammonia (as NH_3)	mg/L	2	<0.011	<0.011
BOD_5	mg/L	2	<2.0	<2.0
Copper. Total Recoverable	mg/L	2	0.0012	0.0014
Iron, Total	mg/L	2	1.48	4.90
Lead, Total Recoverable	mg/L	2	0.00022	0.00054
Nitrogen, Nitrate (as N)	mg/L	2	0.18	0.14
Nitrogen, Nitrite (as N)	mg/L	2	<0.020	<0.020
Nitrogen, Total (as N)	mg/L	2	<0.52	<0.46
Nitrogen, Total Kjeldahl	mg/L	2	0.32	0.30
Oil & Grease[a]	mg/L	1	4.4	NR
pH[b]	SU	1	7.81	NR
Phosphorous, Total	mg/L	2	0.026	0.094
Solids, Setttleable	mL/L	2	<0.1	<0.1
Solids, Total Dissolved	mg/L	2	216	256
Solids, Total Suspended	mg/L	2	4	34
Sulfide	mg/L	2	<0.022	<0.022
Surfactant	mg/L	2	<0.013	<0.013
Vanadium, Total Recoverable	mg/L	2	<0.00078	<0.00078
Zinc, Total Recoverable	mg/L	2	0.0050	0.0046
Rain Event Summary				
pH of Rainfall During Sampling Event	SU	1	7.41	
Rainfall During Sampling Event	inches	--	0.27	
Total Flow During Sampling Event	gallons	--	425	
Maximum Flow Rate During Sampling Event	gpm	--	2.6	

N - Number of samples
NR - Not required by permit
[a] The SPDES permit specifies that oil and grease concentrations shall not exceed 15 mg/L.
[b] The SPDES permit specifies that pH shall not be less than the measured pH of rainfall collected from the site rain gauge at WNSWR01 during storm water discharge sampling or 6.0 SU, whichever is less, and the pH shall not exceed 9.0.

TABLE B-3E *(continued)*
2007 Storm Water Discharge Monitoring Data for Outfall Group 5

Storm Water Outfall S17

Analyte	*Units*	*N*	*First Flush Grab*	*Flow-weighted Composite*
			7/11/07	*7/11/07*
Aluminum, Total	mg/L	2	3.7	2.3
Ammonia (as NH_3)	mg/L	2	0.041	<0.011
BOD_5	mg/L	2	5.2	2.6
Copper. Total Recoverable	mg/L	2	0.0040	0.0033
Iron, Total	mg/L	2	3.0	1.5
Lead, Total Recoverable	mg/L	2	0.0014	0.0012
Nitrogen, Nitrate (as N)	mg/L	2	0.066	0.27
Nitrogen, Nitrite (as N)	mg/L	2	<0.020	<0.020
Nitrogen, Total (as N)	mg/L	2	<0.88	<0.80
Nitrogen, Total Kjeldahl	mg/L	2	0.79	0.51
Oil & Grease[a]	mg/L	1	2.8	NR
pH[b]	SU	1	8.2	NR
Phosphorous, Total	mg/L	2	0.14	0.034
Solids, Setttleable	mL/L	2	0.2	0.2
Solids, Total Dissolved	mg/L	2	83	140
Solids, Total Suspended	mg/L	2	85	30
Sulfide	mg/L	2	0.047	<0.022
Surfactant	mg/L	2	<0.013	<0.013
Vanadium, Total Recoverable	mg/L	2	0.0063	0.0044
Zinc, Total Recoverable	mg/L	2	0.014	0.015
Rain Event Summary				
pH of Rainfall During Sampling Event	SU	1	7.01	
Rainfall During Sampling Event	inches	--	0.94	
Total Flow During Sampling Event	gallons	--	81,000	
Maximum Flow Rate During Sampling Event	gpm	--	820	

N - Number of samples

NR - Not required by permit

[a] The SPDES permit specifies that oil and grease concentrations shall not exceed 15 mg/L.

[b] The SPDES permit specifies that pH shall not be less than the measured pH of rainfall collected from the site rain gauge at WNSWR01 during storm water discharge sampling or 6.0 SU, whichever is less, and the pH shall not exceed 9.0.

TABLE B-3F
2007 Storm Water Discharge Monitoring Data for Outfall Group 6

Storm Water Outfall S41

Analyte	*Units*	*N*	*First Flush Grab*	*Flow-weighted Composite*
			4/25/07	*4/25/07*
Aluminum, Total	mg/L	2	2.44	3.86
Ammonia (as NH_3)	mg/L	2	0.044	0.013
BOD_5	mg/L	2	<2.0	<2.0
Copper, Total Recoverable	mg/L	2	0.0041	0.0051
Iron, Total	mg/L	2	2.39	4.04
Lead, Total Recoverable	mg/L	2	0.0020	0.0023
Nitrogen, Nitrate (as N)	mg/L	2	0.61	0.35
Nitrogen, Nitrite (as N)	mg/L	2	<0.020	<0.020
Nitrogen, Total (as N)	mg/L	2	<1.10	<0.66
Nitrogen, Total Kjeldahl	mg/L	2	0.47	0.29
Oil & Grease[a]	mg/L	1	<2.2	NR
pH[b]	SU	1	7.81	NR
Phosphorous, Total	mg/L	2	0.059	0.083
Solids, Settleable	mL/L	2	<0.1	<0.1
Solids, Total Dissolved	mg/L	2	283	286
Solids, Total Suspended	mg/L	2	63	49
Sulfide	mg/L	2	<0.022	<0.022
Surfactant	mg/L	2	<0.013	<0.013
Vanadium, Total Recoverable	mg/L	2	0.0052	0.0018
Zinc, Total Recoverable	mg/L	2	0.0208	0.0221
Rain Event Summary				
pH of Rainfall During Sampling Event	SU	1	7.41	
Rainfall During Sampling Event	inches	--	0.28	
Total Flow During Sampling Event	gallons	--	1,639	
Maximum Flow Rate During Sampling Event	gpm	--	11.3	

N - Number of samples

NR - Not required by permit

[a] The SPDES permit specifies that oil and grease concentrations shall not exceed 15 mg/L.

[b] The SPDES permit specifies that pH shall not be less than the measured pH of rainfall collected from the site rain gauge at WNSWR01 during storm water discharge sampling or 6.0 SU, whichever is less, and the pH shall not exceed 9.0.

TABLE B-3F *(concluded)*
2007 Storm Water Discharge Monitoring Data for Outfall Group 6

Storm Water Outfall S42

Analyte	*Units*	*N*	*First Flush Grab*	*Flow-weighted Composite*
			7/11/07	*7/11/07*
Aluminum, Total	mg/L	2	0.11	0.61
Ammonia (as NH_3)	mg/L	2	<0.011	<0.011
BOD_5	mg/L	2	2.2	<2.0
Copper, Total Recoverable	mg/L	2	0.0079	0.0061
Iron, Total	mg/L	2	0.51	1.5
Lead, Total Recoverable	mg/L	2	0.00081	0.00098
Nitrogen, Nitrate (as N)	mg/L	2	0.72	0.65
Nitrogen, Nitrite (as N)	mg/L	2	<0.020	<0.020
Nitrogen, Total (as N)	mg/L	2	<1.1	<1.2
Nitrogen, Total Kjeldahl	mg/L	2	0.37	0.48
Oil & Grease[a]	mg/L	1	4.3	NR
pH[b]	SU	1	8.10	NR
Phosphorous, Total	mg/L	2	<0.005	0.0061
Solids, Settleable	mL/L	2	[c]	[c]
Solids, Total Dissolved	mg/L	2	2,900	1,900
Solids, Total Suspended	mg/L	2	<4.0	24
Sulfide	mg/L	2	<0.022	<0.022
Surfactant	mg/L	2	0.027	<0.013
Vanadium, Total Recoverable	mg/L	2	<0.00078	<0.0014
Zinc, Total Recoverable	mg/L	2	0.011	0.013
Rain Event Summary				
pH of Rainfall During Sampling Event	SU	1	7.01	
Rainfall During Sampling Event	inches	--	0.94	
Total Flow During Sampling Event	gallons	--	5,700	
Maximum Flow Rate During Sampling Event	gpm	--	60	

N - Number of samples

NR - Not required by permit

[a] The SPDES permit specifies that oil and grease concentrations shall not exceed 15 mg/L.

[b] The SPDES permit specifies that pH shall not be less than the measured pH of rainfall collected from the site rain gauge at WNSWR01 during storm water discharge sampling or 6.0 SU, whichever is less, and the pH shall not exceed 9.0.

[c] Sample for settleable solids was not sampled/analyzed.

TABLE B-3G
2007 Storm Water Discharge Monitoring Data for Outfall Group 7

Storm Water Outfall S20

Analyte	*Units*	*N*	*First Flush Grab*	*Flow-weighted Composite*
			4/25/07	*4/25/07*
Aluminum, Total	mg/L	2	4.86	0.564
Ammonia (as NH_3)	mg/L	2	<0.011	0.22
BOD_5	mg/L	2	<2.0	3.0
Copper, Total Recoverable	mg/L	2	0.0088	0.0015
Iron, Total	mg/L	2	9.99	1.16
Lead, Total Recoverable	mg/L	2	0.0079	0.00086
Nitrogen, Nitrate (as N)	mg/L	2	0.62	0.45
Nitrogen, Nitrite (as N)	mg/L	2	<0.020	<0.020
Nitrogen, Total (as N)	mg/L	2	<0.82	<0.62
Nitrogen, Total Kjeldahl	mg/L	2	0.18	0.15
Oil & Grease[a]	mg/L	1	<2.2	NR
pH[b]	SU	1	7.57	NR
Phosphorous, Total	mg/L	2	0.057	0.016
Solids, Total Dissolved	mg/L	2	312	59
Solids, Total Suspended	mg/L	2	79	13
Sulfide	mg/L	2	<0.022	<0.022
Surfactant	mg/L	2	0.023	0.019
Zinc, Total Recoverable	mg/L	2	0.156	0.0194
Rain Event Summary				
pH of Rainfall During Sampling Event	SU	1	7.41	
Total Rainfall During Sampling Event	inches	--	0.10	
Total Flow During SamplingEvent	gallons	--	40,299	
Maximum Flow Rate During Sampling Event	gpm	--	290	

N - Number of samples
NR - Not required by permit
[a] The SPDES permit specifies that oil and grease concentrations shall not exceed 15 mg/L.
[b] The SPDES permit specifies that pH shall not be less than the measured pH of rainfall collected from the site rain gauge at WNSWR01 during storm water discharge sampling or 6.0 SU, whichever is less, and the pH shall not exceed 9.0.

TABLE B-3G *(concluded)*
2007 Storm Water Discharge Monitoring Data for Outfall Group 7

Storm Water Outfall S20

Analyte	*Units*	*N*	*First Flush Grab*	*Flow-weighted Composite*
			10/2/07	*10/2/07*
Aluminum, Total	mg/L	3	0.32 / 0.36	0.21
Ammonia (as NH_3)	mg/L	3	0.046 / 0.051	0.13
BOD_5	mg/L	3	3.4 / 2.9	<2.0
Copper, Total Recoverable	mg/L	3	0.0017 / 0.0018	0.00096
Iron, Total	mg/L	3	0.42 / 0.40	0.22
Lead, Total Recoverable	mg/L	3	0.00050 / 0.00058	0.00023
Nitrogen, Nitrate (as N)	mg/L	3	0.87 / 0.87	0.50
Nitrogen, Nitrite (as N)	mg/L	3	<0.020 / <0.020	<0.020
Nitrogen, Total (as N)	mg/L	3	<1.4 / <1.3	<0.78
Nitrogen, Total Kjeldahl	mg/L	3	0.51 / 0.42	0.26
Oil & Grease[a]	mg/L	2	<2.2 / <2.2	NR
pH[b]	SU	2	7.9 / 7.9	NR
Phosphorous, Total	mg/L	3	<0.005 / <0.005	<0.005
Solids, Total Dissolved	mg/L	3	90 / 89	41
Solids, Total Suspended	mg/L	3	23 / 24	8.0
Sulfide	mg/L	3	<0.022 / <0.022	<0.022
Surfactant	mg/L	3	<0.013 / 0.019	<0.013
Zinc, Total Recoverable	mg/L	3	0.011 / 0.0098	0.0097
Rain Event Summary				
pH of Rainfall During Sampling Event	SU	1	4.47	
Total Rainfall During Sampling Event	inches	--	0.25	
Total Flow During SamplingEvent	gallons	--	52,000	
Maximum Flow Rate During Sampling Event	gpm	--	340	

Note: The first flush grab samples were sampled and analyzed in duplicate.
N - Number of samples
NR - Not required by permit
[a] The SPDES permit specifies that oil and grease concentrations shall not exceed 15 mg/L.
[b] The SPDES permit specifies that pH shall not be less than the measured pH of rainfall collected from the site rain gauge at WNSWR01 during storm water discharge sampling or 6.0 SU, whichever is less, and the pH shall not exceed 9.0.

TABLE B-3H
2007 Storm Water Discharge Monitoring Data for Outfall Group 8

Storm Water Outfall S27

Analyte	*Units*	*N*	*First Flush Grab*	*Flow-weighted Composite*
			4/4/07	*4/4/07*
Aluminum, Total	mg/L	2	0.725	0.258
Ammonia (as NH_3)	mg/L	2	<0.011	<0.011
BOD_5	mg/L	2	3.4	<2.0
Copper, Total Recoverable	mg/L	2	0.0034	0.0024
Iron, Total	mg/L	2	0.675	0.226
Lead, Total Recoverable	mg/L	2	0.0020	0.00031
Nitrogen, Nitrate (as N)	mg/L	2	0.039	<0.011
Nitrogen, Nitrite (as N)	mg/L	2	<0.020	<0.020
Nitrogen, Total (as N)	mg/L	2	<0.90	<0.66
Nitrogen, Total Kjeldahl	mg/L	2	0.84	0.63
Oil & Grease[a]	mg/L	1	4.9	NR
pH[b]	SU	1	7.68	NR
Phosphorous, Total	mg/L	2	0.079	0.046
Solids, Total Dissolved	mg/L	2	317	344
Solids, Total Suspended	mg/L	2	163	8.0
Surfactant	mg/L	2	0.027	0.015
Zinc, Total Recoverable	mg/L	2	0.0116	0.0075
Rain Event Summary				
pH of Rainfall During Sampling Event	SU	1	6.51	
Rainfall During Sampling Event	inches	--	0.12	
Total Flow During Sampling Event	gallons	--	456	
Maximum Flow Rate During Sampling Event	gpm	--	2.9	

N - Number of samples

NR - Not required by permit

[a] The SPDES permit specifies that oil and grease concentrations shall not exceed 15 mg/L.

[b] The SPDES permit specifies that pH shall not be less than the measured pH of rainfall collected from the site rain gauge at WNSWR01 during storm water discharge sampling or 6.0 SU, whichever is less, and the pH shall not exceed 9.0.

TABLE B-3H *(concluded)*
2007 Storm Water Discharge Monitoring Data for Outfall Group 8

Storm Water Outfall S35

Analyte	*Units*	*N*	*First Flush Grab*	*Flow-weighted Composite*
			10/2/07	*10/2/07*
Aluminum, Total	mg/L	2	0.13	0.24
Ammonia (as NH_3)	mg/L	2	<0.011	<0.011
BOD_5	mg/L	2	<2.0	<2.0
Copper, Total Recoverable	mg/L	2	0.0031	0.0020
Iron, Total	mg/L	2	0.11	0.19
Lead, Total Recoverable	mg/L	2	0.00059	0.00074
Nitrogen, Nitrate (as N)	mg/L	2	0.091	1.4
Nitrogen, Nitrite (as N)	mg/L	2	<0.020	<0.020
Nitrogen, Total (as N)	mg/L	2	<0.69	<1.8
Nitrogen, Total Kjeldahl	mg/L	2	0.58	0.37
Oil & Grease[a]	mg/L	1	<2.2	NR
pH[b]	SU	1	7.50	NR
Phosphorous, Total	mg/L	2	<0.005	<0.005
Solids, Total Dissolved	mg/L	2	600	510
Solids, Total Suspended	mg/L	2	10	6.0
Surfactant	mg/L	2	0.54	<0.013
Zinc, Total Recoverable	mg/L	2	0.050	0.049
Rain Event Summary				
pH of Rainfall During Sampling Event	SU	1	4.47	
Rainfall During Sampling Event	inches	--	0.25	
Total Flow During Sampling Event	gallons	--	2,900	
Maximum Flow Rate During Sampling Event	gpm	--	32	

N - Number of samples
NR - Not required by permit
[a] The SPDES permit specifies that oil and grease concentrations shall not exceed 15 mg/L.
[b] The SPDES permit specifies that pH shall not be less than the measured pH of rainfall collected from the site rain gauge at WNSWR01 during storm water discharge sampling or 6.0 SU, whichever is less, and the pH shall not exceed 9.0.

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APPENDIX B-4

Site Surface Drainage, Subsurface Drainage, and Contained Water Data

TABLE B-4A
2007 Radioactivity and pH in Surface Water at Facility Yard Drainage (WNSP005)

Analyte	*Units*	*N*	*WNSP005 Concentrations*				*Guideline [a] or Standard [b]*
			Minimum	*Average*	*Maximum*		
Gross Alpha	µCi/mL	11	<1.42E-09	0.39±4.81E-09	1.88E-09		3E-08[c]
Gross Beta	µCi/mL	11	2.56E-08	1.19±0.10E-07	2.81E-07		1E-06[d]
Tritium	µCi/mL	11	<3.23E-08	2.63±5.73E-08	1.54E-07		2E-03
Sr-90	µCi/mL	2	7.99E-08	1.03±0.04E-07	1.27E-07		1E-06
Cs-137	µCi/mL	2	<1.86E-09	1.40±1.89E-09	<1.92E-09		3E-06
pH	SU	12	7.28	7.62	7.94		6.0–9.5

N - Number of samples
[a] DOE ingestion-based DCGs for 100 mrem/yr dose limit are provided as a guideline for radiological results.
[b] New York State Water Quality Standards for Class “D” as a comparative reference for nonradiological results
[c] Alpha as Am-241
[d] Beta as Sr-90

TABLE B-4B
2007 Radioactivity in Surface Water at French Drain (WNSP008)

No Discharge From the French Drain Since May 2001

TABLE B-4C
2007 Water Quality of Surface Water at the North Swamp (WNSW74A)

RADIOACTIVE CONSTITUENTS

Isotope [a]	*N*	*Discharge Activity* [b] *(Ci)*	*Radioactivity* [c] *(Becquerels)*	*Average Concentration (µCi/mL)*	*DCG (µCi/mL)*	*% of DCG*
Gross Alpha	26	1.70±8.04E-05	0.63±2.98E+06	0.36±1.72E-09	NA[d]	NA
Gross Beta	26	6.39±0.91E-05	2.36±0.34E+07	1.36±1.95E-08	NA[d]	NA
Tritium	26	-7.37±7.75E-04	-2.73±2.87E+07	-1.57±1.66E-08	2E-03	<0.01
C-14	2	-0.28±1.13E-03	-1.05±4.19E+07	-0.61±2.42E-08	7E-05	0.04
Sr-90	12	2.51±0.15E-04	9.29±0.55E+06	5.36±0.32E-09	1E-06	0.54
I-129	2	1.28±1.98E-05	4.75±7.34E+05	2.74±4.24E-10	5E-07	0.09
Cs-137	12	4.18±2.59E-05	1.54±0.96E+06	8.92±5.52E-10	3E-06	0.03
U-232[e]	2	0.17±1.50E-06	0.63±5.54E+04	0.36±3.20E-11	1E-07	0.03
U-233/234[e]	2	6.51±2.91E-06	2.41±1.08E+05	1.39±0.62E-10	5E-07	0.03
U-235/236[e]	2	1.24±1.25E-06	4.59±4.61E+04	2.65±2.66E-11	5E-07[f]	<0.01
U-238[e]	2	2.97±2.12E-06	1.10±0.79E+05	6.35±4.53E-11	6E-07	0.01
Pu-238	2	-1.88±4.73E-07	-0.70±1.75E+04	-0.40±1.01E-11	4E-08	0.03
Pu-239/240	2	-9.92±7.30E-07	-3.67±2.70E+04	-2.12±1.56E-11	3E-08	0.05
Am-241	2	0.90±1.43E-06	3.34±5.29E+04	1.93±3.05E-11	3E-08	0.10
Total % of DCG						0.95

N - Number of samples
NA - Not applicable
[a] Half-lives are listed in Table UI-1.
[b] Total estimated volume released: 4.68E+10 mL (1.23E+07 gal)
[c] 1 curie (Ci) = 3.7E+10 becquerels (Bq); 1 Bq= 2.7E-11 Ci
[d] DOE-derived concentration guides (DCGs) do not exist for indicator parameters gross alpha and gross beta.
[e] Total Uranium (g) = 6.29±0.21E+00; Average Total Uranium (µg/mL) = 1.34±0.04E-04
[f] DCG for U-236 is used for this comparison.

TABLE B-4C *(continued)*
2007 Water Quality of Surface Water at the North Swamp (WNSW74A)

CHEMICAL CONSTITUENTS

Analyte	*Units*	*N*	*WNSW74A Concentrations*		*N*	*Reference Values*	
			Average	*Maximum*		*Background Range WFBCBKG* [a]	*Standard* [b]
Alpha-BHC	µ/L	2	<0.011	<0.011	2	<0.009–<0.011	0.002
Aluminum, Total	mg/L	2	<0.10	0.11	0	NA	--
Ammonia-N	mg/L	2	<0.02	<0.02	2	<0.02–<0.02	0.67–29
Antimony, Total	mg/L	2	<0.003	<0.003	2	<0.003–<0.003	--
Arsenic, Dissolved	mg/L	2	<0.005	<0.005	2	<0.005–<0.005	0.340

N - Number of samples
NA - No data available
-- No guideline or standard available for these analytes
[a] Background location
[b] New York State Water Quality Standards, Class "D" as a comparative reference for nonradiological results at WNSW74A

TABLE B-4C *(concluded)*
2007 Water Quality of Surface Water at the North Swamp (WNSW74A)

CHEMICAL CONSTITUENTS ***(concluded)***

Analyte	Units	N	WNSW74A Concentrations Average	WNSW74A Concentrations Maximum	N	Reference Values: Background Range WFBCBKG [a]	Reference Values: Standard [b]
Boron, Total	mg/L	2	0.04	0.06	2	0.02–0.04	--
Bromide	mg/L	2	<0.68	0.87	2	<0.50–<0.50	--
Cadmium, Total	mg/L	2	<0.001	<0.001	0	NA	--
Calcium, Total	mg/L	2	96.2	102	12	17.3–53.3	--
Chromium, Total	mg/L	2	<0.01	<0.01	0	NA	--
Cobalt, Total	mg/L	2	<0.005	<0.005	2	<0.005–<0.005	0.110[c]
Copper, Dissolved	mg/L	2	<0.005	<0.005	2	<0.005–<0.005	0.039[d]
Copper, Total	mg/L	2	<0.005	<0.005	0	NA	--
Fluoride	mg/L	2	<0.10	<0.10	2	<0.10–<0.10	29.4[d]
Hardness	mg/L	2	294	308	12	56–164	--
Iron, Total	mg/L	2	0.14	0.16	2	0.29–0.44	0.30
Lead, Total	mg/L	2	<0.0005	<0.0005	0	NA	--
Magnesium, Total	mg/L	2	12.9	13	12	3.05–7.55	--
Manganese, Total	mg/L	2	0.07	0.08	2	0.03–0.04	--
Mercury, Total, Method 1631	µg/L	2	R	R	0	NA	--
Nickel, Total	mg/L	2	<0.040	<0.040	0	NA	--
Nitrate-N	mg/L	2	0.22	0.26	2	0.14–0.22	--
Nitrite-N	mg/L	2	<0.05	<0.05	2	<0.05–<0.05	--
NPOC	mg/L	2	4.6	4.8	2	1.9–2.9	--
Oil & Grease	mg/L	2	<5	<5	2	<5–<5	--
pH	SU	28	7.13	7.81	2	7.92–7.98	6.0–9.5
Selenium, Total	mg/L	2	<0.001	<0.001	0	NA	--
Solids, Total Dissolved	mg/L	2	886	901	2	196–226	--
Solids, Total Suspended	mg/L	2	<7	11	2	<4–<4	--
Sulfate	mg/L	2	50	59.7	2	20.1–47.2	--
Sulfide	mg/L	2	<0.04	<0.04	2	<0.04–<0.04	--
Surfactants	mg/L	2	<0.07	<0.10	2	<0.02–<0.10	--
Thallium, Total	mg/L	2	<0.008	<0.008	2	<0.008–<0.008	0.020[c]
Titanium, Total	mg/L	2	<0.050	<0.050	2	<0.050–<0.050	--
TOX	mg/L	2	<0.02	0.02	2	0.05–0.13	--
Vanadium, Total	mg/L	2	<0.010	<0.010	2	<0.010–<0.010	0.190[c]
Zinc, Total	mg/L	2	<0.02	<0.02	0	NA	--

N - Number of samples
NA - No data available
R - Sample data rejected due to analytical quality control failure.
-- No guideline or standard available for these analytes
[a] Background location
[b] New York State Water Quality Standards, Class "D" as a comparative reference for nonradiological results at WNSW74A
[c] Standards for cobalt, thallium, and vanadium are applicable to the acid-soluble fraction.
[d] Calculated from maximum measurement of hardness of surface water drainage at WNSW74A

TABLE B-4D
2007 Water Quality of Surface Water at the Northeast Swamp (WNSWAMP)

RADIOACTIVE CONSTITUENTS

Isotope [a]	Discharge Activity [b] (Ci)	Radioactivity [c] (Becquerels)	Average Concentration (µCi/mL)	DCG [d] (µCi/mL)	Ratio of Concentration to DCG
Gross Alpha	1.26±4.12E-04	0.47±1.53E+07	0.58±1.88E-09	NA[e]	NA
Gross Beta	6.44±0.12E-01	2.38±0.05E+10	2.94±0.06E-06	NA[e]	NA
H-3	1.11±0.77E-02	4.12±2.86E+08	5.07±3.52E-08	2E-03	<0.0001
C-14	-5.39±6.91E-03	-1.99±2.56E+08	-2.46±3.15E-08	7E-05	0.0005
Sr-90	3.43±0.02E-01	1.27±0.01E+10	1.56±0.01E-06	1E-06	1.56
I-129	-0.26±1.00E-04	-0.97±3.72E+06	-1.19±4.58E-10	5E-07	0.0009
Cs-137	0.57±2.09E-04	2.09±7.74E+06	2.57±9.54E-10	3E-06	0.0003
U-232[f]	0.66±1.35E-05	2.45±4.98E+05	3.01±6.13E-11	1E-07	0.0006
U-233/234[f]	4.62±1.95E-05	0.17±7.22E+05	2.11±0.89E-10	5E-07	0.0004
U-235/236[f]	0.95±1.14E-05	3.53±1.23E+05	4.35±5.22E-11	5E-07[g]	0.0001
U-238[f]	3.61±1.67E-05	0.13±6.18E+05	1.64±0.76E-10	6E-07	0.0003
Pu-238	0.00±1.24E-05	0.03±4.58E+05	0.04±5.65E-11	4E-08	0.0014
Pu-239/240	0.66±1.24E-05	2.46±4.58E+05	3.03±5.65E-11	3E-08	0.0019
Am-241	1.13±2.63E-06	4.18±9.75E+04	0.52±1.20E-11	3E-08	0.0004
Sum of Ratios					**1.57**

NA - Not applicable

[a] Half-lives are listed in Table UI-4.

[b] Total volume released: 2.19E+11 mL (5.80E+07 gal)

[c] 1 curie (Ci) = 3.7E+10 becquerels (Bq); 1 Bq = 2.7E-11 Ci

[d] DCGs are listed for reference only. DCGs are applicable at the point at which water is available for ingestion by the public (i.e., at the site boundary), but not to release point concentrations, as might be inferred from their inclusion in this table.

[e] DOE DCGs do not exist for indicator parameters gross alpha and gross beta.

[f] Total Uranium (g) = 6.67±0.38E+01; Average Total Uranium (µg/mL) = 3.04±0.18E-04

[g] DCG for U-236 is used for this comparison.

TABLE B-4D *(continued)*
2007 Water Quality of Surface Water at the Northeast Swamp (WNSWAMP)

CHEMICAL CONSTITUENTS

Analyte	Units	N	WNSWAMP Concentrations		N	Reference Values	
			Average	Maximum		WFBCBKG [a] Background Range	Standard [b]
Alpha-BHC	µ/L	2	<0.009	<0.009	2	<0.009–<0.011	0.002
Aluminum, Total	mg/L	2	<0.10	<0.10	0	NA	--
Ammonia-N	mg/L	2	<0.06	0.08	2	<0.02–<0.02	0.67–29
Antimony, Total	mg/L	2	<0.003	<0.003	2	<0.003–<0.003	--

N - Number of samples

NA - Not applicable

-- No guideline or standard available for these analytes

[a] Background location

[b] New York Water Quality Standards, Class "D" as a comparative reference for non-radiological results at WNSWAMP

TABLE B-4D *(concluded)*
2007 Water Quality of Surface Water at the Northeast Swamp (WNSWAMP)

CHEMICAL CONSTITUENTS *(concluded)*

Analyte	*Units*	*N*	*WNSWAMP Concentrations*		*N*	*Reference Values*	
			Average	*Maximum*		*WFBCBKG*[a] *Background Range*	*Standard*[b]
Arsenic, Dissolved	mg/L	2	<0.005	<0.005	2	<0.005–<0.005	0.340
Boron, Total	mg/L	2	0.04	0.05	2	0.02–0.04	--
Bromide	mg/L	2	0.82	0.84	2	<0.50–<0.50	--
Cadmium, Total	mg/L	2	<0.001	<0.001	0	NA	--
Calcium, Total	mg/L	2	122	125	12	17.3–53.3	--
Chromium, Total	mg/L	2	<0.010	<0.010	0	NA	--
Cobalt, Total	mg/L	2	<0.005	<0.005	2	<0.005–<0.005	0.110[c]
Copper, Dissolved	mg/L	2	<0.005	<0.005	2	<0.005–<0.005	0.047[d]
Copper, Total	mg/L	2	<0.005	<0.005	0	NA	--
Fluoride	mg/L	2	0.12	0.12	2	<0.10–<0.10	35.6[d]
Hardness	mg/L	2	374	380	12	56–164	--
Iron, Total	mg/L	2	<0.52	1	2	0.29–0.44	0.30
Lead, Total	mg/L	2	<0.0005	<0.0005	0	NA	--
Magnesium, Total	mg/L	2	16.9	17.3	12	3.05–7.55	--
Manganese, Total	mg/L	2	0.41	0.69	2	0.03–0.04	--
Mercury, Total, Method 1631	µg/L	2	0.000814	0.00106	0	NA	--
Nickel, Total	mg/L	2	<0.040	<0.040	0	NA	--
Nitrate-N	mg/L	2	0.2	0.28	2	0.14–0.22	--
Nitrite-N	mg/L	2	<0.03	<0.03	2	<0.05–<0.05	--
NPOC	mg/L	2	3.7	4.7	2	1.9–2.9	--
Oil & Grease	mg/L	2	<5	<5	2	<5–<5	--
pH	SU	27	7.48	7.96	2	7.92–7.98	6.0–9.5
Selenium, Total	mg/L	2	<0.002	<0.002	0	NA	--
Solids, Total Dissolved	mg/L	2	930	963	2	196–226	--
Solids, Total Suspended	mg/L	2	<4	<4	2	<4–<4	--
Sulfate	mg/L	2	28.6	32.5	2	20.1–47.2	--
Sulfide (as S)	mg/L	2	<0.04	<0.06	2	<0.04–<0.04	--
Surfactant	mg/L	2	0.04	0.05	2	<0.02–<0.10	--
Thallium, Total	mg/L	2	<0.008	<0.008	2	<0.008–<0.008	0.020[c]
Titanium, Total	mg/L	2	<0.050	<0.050	2	<0.050–<0.050	--
TOX	mg/L	1	0.02	0.02	2	0.05–0.13	--
Vanadium, Total	mg/L	2	<0.010	<0.010	2	<0.010–<0.010	0.190[c]
Zinc, Total	mg/L	2	<0.02	<0.02	0	NA	--

N - Number of samples
NA - Not applicable
-- No guideline or standard available for these analytes
[a] Background location
[b] New York Water Quality Standards, Class "D" as a comparative reference for non-radiological results at WNSWAMP
[c] Standards for cobalt, thallium, and vanadium are acid-soluble.
[d] Calcuated from maximum measurement of hardness of surface water stream at WNSWAMP

TABLE B-4E
2007 Water Quality Results at Storage and Disposal Area Drainage (WNNDADR)

Analyte	*Units*	*N*	*WNNDADR Concentrations*			*Standard* [a]
			Minimum	*Average*	*Maximum*	
Gross Alpha	µCi/mL	14	<1.02E-09	1.66±2.01E-09	5.84E-09	--
Gross Beta	µCi/mL	14	1.50E-07	2.09±0.09E-07	4.06E-07	--
Tritium	µCi/mL	25	1.50E-07	5.87±0.66E-07	1.15E-06	--
Sr-90	µCi/mL	2	8.86E-08	9.83±0.45E-08	1.08E-07	--
I-129	µCi/mL	2	5.92E-10	3.14±5.57E-10	5.92E-10	--
Cs-137	µCi/mL	12	<1.30E-09	0.87±2.16E-09	4.30E-09	--
NPOC	mg/L	26	2	6.4	23	--
pH	SU	26	6.96	7.57	7.94	6.0–9.5
TOX	mg/L	25	<0.01	<0.01	0.02	--

N - Number of samples

-- No applicable reference standard available

[a] New York State Water Quality Standards, Class “D” as a comparative reference for nonradiological results at WNNDADR

TABLE B-4F
2007 Water Quality Results in Subsurface Water at the NDA Interceptor Trench (WNNDATR)

Analyte	*Units*	*N*	*WNNDATR Concentrations*		
			Minimum	*Average*	*Maximum*
Gross Alpha	µCi/mL	12	<1.60E-09	3.34±3.03E-09	1.05E-08
Gross Beta	µCi/mL	12	2.05E-07	3.63±0.17E-07	5.50E-07
Tritium	µCi/mL	12	5.91E-07	2.02±0.10E-06	3.50E-06
I-129	µCi/mL	2	7.30E-10	3.65±9.62E-10	7.30E-10
Cs-137	µCi/mL	12	<1.31E-09	0.48±1.74E-09	<2.01E-09
NPOC	mg/L	12	2.7	3.7	4.4
TOX	mg/L	11	<0.01	<0.01	0.02

Note: No applicable reference standard available for this location. These waters are pumped and treated at the LLWTF prior to discharge at outfall WNSP001.

N - Number of samples

TABLE B-4G
2007 Radioactivity and pH in Surface Water at Cooling Tower Basin (WNCOOLW)

Analyte	*Units*	*N*	*WNCOOLW*
Gross Alpha	µCi/mL	1	2.65±1.94E-09
Gross Beta	µCi/mL	1	6.28±3.88E-09
Tritium	µCi/mL	1	9.12±9.79E-08
Sr-90	µCi/mL	1	-4.22±6.66E-10
Cs-137	µCi/mL	1	-0.06±1.94E-09
pH	SU	1	7.67

Note: No applicable reference standard available for this location. These waters are pumped and treated at the LLWTF prior to discharge at outfall WNSP001.

N - Number of samples

APPENDIX B-5

Ambient Surface Water Data

TABLE B-5A

2007 Radioactivity and pH in Surface Water Downstream of the WVDP in Cattaraugus Creek at Felton Bridge (WFFELBR)

Analyte	*Units*	*N*	*WFFELBR Concentrations*		*N*	*Reference Values*	
			Average	*Maximum*		*WFBIGBR* [a] *Background Range*	*Guideline* [b] *or Standard* [c]
Gross Alpha	µCi/mL	12	1.71±1.83E-09[d]	6.00E-09[d]	4	<7.02E-10–2.16E-09	3E-08[e]
Gross Beta	µCi/mL	12	3.54±1.81E-09[d]	5.20E-09[d]	5	1.64E-09–1.37E-08	1E-06[f]
Tritium	µCi/mL	12	0.03±5.69E-08[d]	1.78E-07[d]	4	<4.46E-08–4.78E-08	2E-03
Sr-90	µCi/mL	12	2.16±6.47E-10	1.01E-09	4	<3.57E-10–<1.03E-09	1E-06
Tc-99	µCi/mL	2	5.45±2.16E-09	1.14E-08	0	NA	1E-04
Cs-137	µCi/mL	12	0.72±1.83E-09	2.09E-09	4	<1.85E-09–<2.05E-09	3E-06
pH	SU	35	7.87	8.31	4	8.08–8.27	6.5–8.5

N - Number of samples
NA - Data not available
[a] Background location
[b] DOE ingestion-based DCGs for 100 mrem/yr dose limit are provided as a guideline for radiological results in the absence of water quality standards.
[c] New York State Water Quality Standards, Class "B" as a comparative reference for nonradiological results
[d] Values represent composite concentrations weighted to monthly stream flow.
[e] Alpha as Am-241
[f] Beta as Sr-90

TABLE B-5B

2007 Water Quality of Surface Water Downstream of the WVDP in Buttermilk Creek at Thomas Corners Bridge (WFBCTCB)

RADIOACTIVITY CONCENTRATIONS

Analyte	*Units*	*N*	*WFBCTCB Concentrations*		*N*	*Reference Values*	
			Average	*Maximum*		*WFBCBKG* [a] *Background Range*	*Guideline* [b]
Gross Alpha	µCi/mL	12	1.99±1.52E-09	1.60E-08	12	<5.74E-10–7.63E-10	3E-08[c]
Gross Beta	µCi/mL	12	9.18±1.97E-09	1.64E-08	12	9.78E-10–3.87E-09	1E-06[d]
Tritium	µCi/mL	12	1.47±5.30E-08	1.36E-07	12	<3.13E-08–9.75E-08	2E-03
Sr-90	µCi/mL	2	1.58±1.09E-09	1.82E-09	4	<3.27E-10–<5.63E-10	1E-06
Tc-99	µCi/mL	2	0.88±1.88E-09	<2.01E-09	4	<1.72E-09–<2.82E-09	1E-04
Cs-137	µCi/mL	2	0.83±1.86E-09	<1.91E-09	4	<1.82E-09–<2.04E-09	3E-06

N - Number of samples
[a] Background location
[b] DOE ingestion-based DCGs for 100 mrem/yr dose limit are provided as a guideline for radiological results in the absence of water quality standards.
[c] Alpha as Am-241
[d] Beta as Sr-90

TABLE B-5B *(continued)*
2007 Water Quality of Surface Water Downstream of the WVDP in Buttermilk Creek at Thomas Corners Bridge (WFBCTCB)

CHEMICAL CONSTITUENTS

Analyte	*Units*	*N*	*WFBCTCB Concentrations*		*N*	*Reference Values*	
			Average	*Maximum*		*WFBCBKG [a] Background Range*	*Standard [b]*
Alpha-BHC	µg/L	2	<0.009	<0.010	2	<0.009–<0.011	0.002
Aluminum, Dissolved	mg/L	2	<0.10	<0.10	2	<0.10–<0.10	0.10
Ammonia-N	mg/L	2	<0.02	<0.02	2	<0.02–<0.02	0.09–2.1
Antimony, Total	mg/L	2	<0.003	<0.003	2	<0.003–<0.003	--
Arsenic, Dissolved	mg/L	2	<0.005	<0.005	2	<0.005–<0.005	0.150
Barium, Total	mg/L	2	0.08	0.08	2	0.10–0.12	--
Boron, Total	mg/L	2	0.03	0.03	2	0.02–0.04	10.0
Bromide	mg/L	2	<0.50	<0.50	2	<0.50–<0.50	--
Cadmium, Dissolved	mg/L	2	<0.001	<0.001	2	<0.001–<0.001	0.003[c]
Calcium, Total	mg/L	12	40.3	58.6	12	17.3–53.3	--
Chloride	mg/L	2	32	32	2	17–27	--
Chromium, Dissolved	mg/L	2	<0.01	<0.01	2	<0.01–<0.01	0.122[c]
Cobalt, Total	mg/L	2	<0.005	<0.005	2	<0.005–<0.005	0.005[d]
Copper, Dissolved	mg/L	2	<0.005	<0.005	2	<0.005–<0.005	0.015[c]
Dissolved, Oxygen	mg/L	2	9.6	10.4	2	8.8–11.0	4.0 (min)
Fluoride	mg/L	2	<0.10	<0.10	2	<0.10–<0.10	3.69[c]
Hardness	mg/L	12	128	184	12	56–164	--
Iron, Total	mg/L	2	0.3	0.5	2	0.29–0.44	0.30
Lead, Dissolved	mg/L	2	<0.0005	<0.0005	2	<0.0005–<0.0005	0.007[c]
Magnesium, Total	mg/L	12	6.68	9.24	12	3.05–7.55	--
Manganese, Total	mg/L	2	0.03	0.04	2	0.03–0.04	--
Mercury, Dissolved, Method 1631	µg/L	2	<0.000610	0.000721	2	<0.000500–0.000776	--
Nickel, Dissolved	mg/L	2	<0.04	<0.04	2	<0.04–<0.04	0.087[c]
Nitrate-N	mg/L	2	0.47	0.6	2	0.14–0.22	--
Nitrite-N	mg/L	2	<0.05	<0.05	2	<0.05–<0.05	0.10
NPOC	mg/L	2	2	2.2	2	1.9–2.9	--

N - Number of samples
-- No reference standard available for this analyte
[a] Background location
[b] New York State Water Quality Standards, Class "C" as a comparative reference for nonradiological results
[c] Calculated from maximum measurement of hardness of surface water stream at WFBCTCB
[d] Standards for cobalt, thallium, and vanadium are applicable to the acid-soluble fraction.

TABLE B-5B *(concluded)*
2007 Water Quality of Surface Water Downstream of the WVDP in Buttermilk Creek at Thomas Corners Bridge (WFBCTCB)

CHEMICAL CONSTITUENTS *(concluded)*

Analyte	*Units*	*N*	*WFBCTCB Concentrations*			*N*	*Reference Values*	
			Average	*Maximum*			*WFBCBKG[a] Background Range*	*Standard[b]*
Oil & Grease	mg/L	2	<5	<5		2	<5–<5	--
pH	SU	2	7.42	8.08		2	7.92–7.98	6.5–8.5
Selenium, Dissolved	mg/L	2	<0.001	<0.001		2	<0.001–<0.001	0.0046
Sodium, Total	mg/L	2	19.6	19.7		2	11.6–16.0	--
Solids, Total Dissolved	mg/L	2	206	210		2	196–226	500
Solids, Total Suspended	mg/L	2	<8	12		2	<4–<4	--
Sulfate	mg/L	2	31.7	35.4		2	20.1–47.2	--
Sulfide (as S)	mg/L	2	<0.04	<0.04		2	<0.04–<0.04	0.002
Surfactant	mg/L	2	<0.06	<0.10		2	<0.02–<0.10	0.04
Thallium, Total	mg/L	2	<0.008	<0.008		2	<0.008–<0.008	0.008[d]
Titanium, Total	mg/L	2	<0.050	<0.050		2	<0.050–<0.050	--
TOX	mg/L	2	<0.01	0.02		2	0.05–0.13	--
Vanadium, Total	mg/L	2	<0.010	<0.010		2	<0.010–<0.010	0.014[d]
Zinc, Dissolved	mg/L	2	<0.02	<0.02		2	<0.02–<0.02	0.139[c]

N - Number of samples
-- No reference standard available for this analyte
[a] Background location
[b] New York State Water Quality Standards, Class "C" as a comparative reference for nonradiological results
[c] Calculated from maximum measurement of hardness of surface water stream at WFBCTCB
[d] Standards for cobalt, thallium, and vanadium are applicable to the acid-soluble fraction.

TABLE B-5C
2007 Water Quality of Surface Water Downstream of the WVDP at Franks Creek (WNSP006)

RADIOACTIVITY CONCENTRATIONS

Analyte	Units	N	WNSP006 Concentrations		N	Reference Values	
			Average	Maximum		WFBCBKG[a] Background Range	Guideline[b]
Gross Alpha	µCi/mL	35	1.14±2.53E-09	9.96E-09	12	<5.74E-10–7.63E-10	3E-08[c]
Gross Beta	µCi/mL	35	4.20±0.49E-08	7.70E-08	12	9.78E-10–3.87E-09	1E-06[d]
Tritium	µCi/mL	35	8.32±5.90E-08	3.72E-07	12	<3.13E-08–9.75E-08	2E-03
C-14	µCi/mL	4	-1.06±2.99E-08	<3.88E-08	4	<1.68E-08–<3.20E-08	7E-05
Sr-90	µCi/mL	12	1.72±0.18E-08	2.51E-08	4	<3.27E-10–<5.63E-10	1E-06
Tc-99	µCi/mL	4	-0.54±2.13E-09	<2.75E-09	4	<1.72E-09–<2.82E-09	1E-04
I-129	µCi/mL	4	-2.04±6.18E-10	<8.10E-10	4	<3.28E-10–<1.20E-09	5E-07
Cs-137	µCi/mL	12	3.86±2.91E-09	9.90E-09	4	<1.82E-09–<2.04E-09	3E-06
U-232	µCi/mL	4	1.28±0.84E-10	2.70E-10	4	<3.68E-11–<5.43E-11	1E-07
U-233/234	µCi/mL	4	2.65±1.15E-10	3.40E-10	4	<7.35E-11–1.12E-10	5E-07
U-235/236	µCi/mL	4	2.64±4.65E-11	3.70E-11	4	<1.98E-11–7.01E-11	5E-07[e]
U-238	µCi/mL	4	2.16±1.01E-10	2.67E-10	4	<2.62E-11–8.77E-11	6E-07
Total U	µg/mL	4	5.67±0.25E-04	6.83E-04	4	<2.29E-06–1.96E-04	--
Pu-238	µCi/mL	4	0.56±2.98E-11	<3.89E-11	4	<7.59E-12–<2.79E-11	4E-08
Pu-239/240	µCi/mL	4	2.42±3.18E-11	4.75E-11	4	<1.53E-11–<3.16E-11	3E-08
Am-241	µCi/mL	4	1.80±4.06E-11	<5.63E-11	4	<1.36E-11–<3.98E-11	3E-08

N - Number of samples
-- No guideline or standard available for these analytes
[a] Background location
[b] DOE ingestion-based DCGs for 100 mrem/yr dose limit are provided as a guideline for radiological results.
[c] Alpha as Am-241
[d] Beta as Sr-90
[e] DCG for U-236 is used for this comparison.

TABLE B-5C *(continued)*
2007 Water Quality of Surface Water Downstream of the WVDP at Franks Creek (WNSP006)

CHEMICAL CONSTITUENTS

Analyte	Units	N	WNSP006 Concentrations		N	Reference Values	
			Average	Maximum		WFBCBKG[a] Background Range	Standard[b]
Alpha-BHC	µg/L	2	<0.013	0.017	2	<0.009–<0.011	0.002
Aluminum, Dissolved	mg/L	2	<0.10	<0.10	2	<0.10–<0.10	0.10
Ammonia-N	mg/L	2	<0.02	<0.02	2	<0.02–<0.02	0.09–2.1
Antimony, Total	mg/L	2	<0.003	<0.003	2	<0.003–<0.003	--
Arsenic, Dissolved	mg/L	2	<0.005	<0.005	2	<0.005–<0.005	0.150

N - Number of samples
-- No guideline or standard available for these analytes
[a] Background location
[b] New York Water Quality Standards for Class "C" surface waters as a comparative reference for nonradiological results.

TABLE B-5C *(concluded)*
2007 Water Quality of Surface Water Downstream of the WVDP at Franks Creek (WNSP006)

CHEMICAL CONSTITUENTS ***(concluded)***

Analyte	*Units*	*N*	*WNSP006 Concentrations*		*N*	*Reference Values*	
			Average	*Maximum*		*WFBCBKG [a] Background Range*	*Standard [b]*
Barium, Total	mg/L	2	0.05	0.05	2	0.10–0.12	--
Boron, Total	mg/L	2	0.03	0.04	2	0.02–0.04	10.0
Bromide	mg/L	2	<0.50	<0.50	2	<0.50–<0.50	--
Cadmium, Dissolved	mg/L	2	<0.001	<0.001	2	<0.001–<0.001	0.004[c]
Calcium, Total	mg/L	12	47.1	67.6	12	17.3–53.3	--
Chloride	mg/L	2	110	122	2	17–27	--
Chromium, Dissolved	mg/L	2	<0.01	<0.01	2	<0.01–<0.01	0.137[c]
Cobalt, Total	mg/L	2	<0.005	<0.005	2	<0.005–<0.005	0.005[d]
Copper, Dissolved	mg/L	2	<0.005	<0.005	2	<0.005–<0.005	0.017[c]
Dissolved Oxygen	mg/L	2	10.2	10.4	2	8.8–11.0	4.0 (min)
Fluoride	mg/L	2	<0.11	0.12	2	<0.10–<0.10	4.19[c]
Hardness	mg/L	12	150	212	12	56–164	--
Iron, Total	mg/L	2	1.92	2	2	0.29–0.44	0.30
Lead, Dissolved	mg/L	2	<0.0005	<0.0005	2	<0.0005–<0.0005	0.008[c]
Magnesium, Total	mg/L	12	7.78	10.4	12	3.05–7.55	--
Manganese, Total	mg/L	2	0.12	0.13	2	0.03–0.04	--
Mercury, Dissolved, Method 1631	µg/L	1	0.012	0.012	2	<0.000500–0.000776	--
Nickel, Dissolved	mg/L	2	<0.04	<0.04	2	<0.04–<0.04	0.098[c]
Nitrate-N	mg/L	2	0.98	1.6	2	0.14–0.22	--
Nitrite-N	mg/L	2	<0.05	<0.05	2	<0.05–<0.05	0.10
NPOC	mg/L	2	4	4.4	2	1.9–2.9	--
Oil & Grease	mg/L	2	<5	<5	2	<5–<5	--
pH	SU	2	7.48	7.74	2	7.92–7.98	6.5–8.5
Selenium, Dissolved	mg/L	2	<0.001	<0.001	2	<0.001–<0.001	0.0046
Sodium, Total	mg/L	2	91.8	93.5	2	11.6–16.0	--
Solids, Total Dissolved	mg/L	31	419	2,238	2	196–226	500
Solids, Total Suspended	mg/L	2	22	23	2	<4–<4	--
Sulfate	mg/L	2	61.2	75	2	20.1–47.2	--
Sulfide (as S)	mg/L	2	<0.04	<0.04	2	<0.04–<0.04	0.002
Surfactants	mg/L	2	<0.02	<0.02	2	<0.02–<0.10	0.40
Thallium, Total	mg/L	2	<0.008	<0.008	2	<0.008–<0.008	0.008[d]
Titanium, Total	mg/L	2	<0.050	<0.050	2	<0.050–<0.050	--
TOX	mg/L	2	0.04	0.05	2	0.05–0.13	--
Vanadium, Total	mg/L	2	<0.010	<0.010	2	<0.010–<0.010	0.014[d]
Zinc, Dissolved	mg/L	2	<0.02	<0.02	2	<0.02–<0.02	0.157[c]

N - Number of samples
-- No guideline or standard available for these analytes
[a] Background location
[b] New York Water Quality Standards for Class "C" surface waters as a comparative reference for nonradiological results.
[c] Calculated from maximum measured hardness of surface water stream at WNSP006.
[d] Standards for cobalt, thallium, and vanadium are applicable to the acid-soluble fraction.

TABLE B-5D
2007 Radioactivity and pH in Surface Water at Erdman Brook (WNERB53)

Analyte	*Units*	*N*	*WNERB53 Concentrations*			*Reference Guideline [a] or Standard [b]*
			Minimum	*Average*	*Maximum*	
Gross Alpha	µCi/mL	4	<1.18E-09	0.80±2.84E-09	<4.42E-09	3E-08[c]
Gross Beta	µCi/mL	4	1.51E-08	1.77±0.33E-08	1.99E-08	1E-06[d]
Tritium	µCi/mL	4	<4.56E-08	5.33±6.37E-08	1.60E-07	2E-03
Sr-90	µCi/mL	2	7.99E-09	8.78±1.60E-09	9.58E-09	1E-06
Cs-137	µCi/mL	2	<1.35E-09	0.05±1.71E-09	<2.00E-09	3E-06
pH	SU	4	7.48	7.71	7.92	6.0–9.5

N - Number of samples

[a] DOE ingestion-based DCGs for 100 mrem/yr dose limit are provided as a guideline for radiological results.

[b] New York State Water Quality Standards, Class “D” for surface waters as a standard for nonradiological results

[c] Alpha as Am-241

[d] Beta as Sr-90

TABLE B-5E
2007 Radioactivity and pH in Surface Water at Franks Creek East of the SDA (WNFRC67)

Analyte	*Units*	*N*	*WNFRC67 Concentrations*			*Reference Guideline [a] or Standard [b]*
			Minimum	*Average*	*Maximum*	
Gross Alpha	µCi/mL	4	<6.35E-10	0.09±1.17E-09	<1.70E-09	3E-08[c]
Gross Beta	µCi/mL	4	1.72E-09	2.57±1.45E-09	3.26E-09	1E-06[d]
Tritium	µCi/mL	4	<4.60E-08	4.75±6.13E-08	1.74E-07	2E-03
Sr-90	µCi/mL	4	<5.66E-10	1.08±7.93E-10	7.55E-10	1E-06
Cs-137	µCi/mL	4	<1.86E-09	0.86±1.91E-09	<1.98E-09	3E-06
pH	SU	4	7.07	7.33	7.93	6.5–8.5

N - Number of samples

[a] DOE ingestion-based DCGs for 100 mrem/yr dose limit are provided as a guideline for radiological results in the absence of water quality standards.

[b] New York State Water Quality Standards for Class “C” surface waters as a comparative reference for nonradiological results.

[c] Alpha as Am-241

[d] Beta as Sr-90

TABLE B-5F
2007 Radioactivity and pH in Surface Water at Drum Cell Drainage (WNDCELD)

Analyte	*Units*	*N*	*WNDCELD Concentrations*			*Reference Guideline* [a] *or Standard* [b]
			Minimum	*Average*	*Maximum*	
Gross Alpha	µCi/mL	6	<6.54E-10	0.18±1.77E-09	<2.76E-09	3E-08[c]
Gross Beta	µCi/mL	6	1.43E-09	2.83±1.93E-09	5.91E-09	1E-06[d]
Tritium	µCi/mL	6	<4.55E-08	1.13±5.82E-08	<9.80E-08	2E-03
Sr-90	µCi/mL	2	<6.20E-10	3.22±6.73E-10	<7.22E-10	1E-06
I-129	µCi/mL	2	<3.59E-10	-0.93±8.27E-10	<1.11E-09	5E-07
Cs-137	µCi/mL	2	<1.92E-09	0.85±1.91E-09	2.70E-09	3E-06
pH	SU	6	7.34	7.5	7.74	6.5–8.5

N - Number of samples
[a] DOE ingestion-based DCGs for 100 mrem/yr dose limit are provided as a guideline for radiological results in the absence of water quality standards.
[b] New York State Water Quality Standards for Class "C" surface waters as a comparative reference for nonradiological results.
[c] Alpha as Am-241
[d] Beta as Sr-90

TABLE B-5G
2007 Water Quality of Surface Water at the Standing Water Location (WNSTAW9)

Analyte	*Units*	*N*	*WNSTAW9*	*Reference Values Guideline* [a] *or Standard* [b]
Gross Alpha	µCi/mL	1	0.63±6.06E-10	3E-08[c]
Gross Beta	µCi/mL	1	2.40±0.98E-09	1E-06[d]
Tritium	µCi/mL	1	-0.56±4.53E-08	2E-03
Sr-90	µCi/mL	1	4.94±7.02E-10	1E-06
Cs-137	µCi/mL	1	-0.08±1.92E-09	3E-06
Chloride	mg/L	1	13	--
Conductivity	µmhos/cm@25^{o}C	1	276	--
Iron, Total	mg/L	1	0.11	0.3
Manganese, Total	mg/L	1	0.03	--
Nitrate+Nitrite	mg/L	1	<0.05	--
pH	SU	1	7.94	6.5- 8.5
Sodium, Total	mg/L	1	9.8	--
Sulfate	mg/L	1	17.6	--

N - Number of samples
-- No guideline or standard available for these analytes
[a] DOE ingestion-based DCGs for 100 mrem/yr dose limit are provided as a guideline for radiological results.
[b] New York State Water Quality Standards Class "D" surface waters as a comparative standard for nonradiological results
[c] Alpha as Am-241
[d] Beta as Sr-90

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APPENDIX B-6

Potable Water (Drinking Water) Data

TABLE B-6A
2007 Water Quality Results in Potable Well Water Around the WVDP

Analyte	*Units*	*N*	*Background WFWEL06*	*Standard* [a,b]
Gross Alpha	µCi/mL	1	-1.46±1.14E-09	1.5E-08[c]
Gross Beta	µCi/mL	1	1.41±1.18E-09	1E-06[d]
Tritium	µCi/mL	1	-7.61±3.20E-08	--
Sr-90	µCi/mL	1	-1.23±5.36E-10	8E-09[e]
Cs-137	µCi/mL	1	-0.49±2.12E-09	--
Conductivity	µmhos/cm@25°C	1	292	--
pH	SU	1	8.20	6.5–8.5

N - Number of samples
-- No guideline or standard available for these analytes
[a] New York State Water Quality Standard for Class "GA" for fresh groundwater
[b] NYSDOH raw water supply standards (10 NYCRR Part 170.4)
[c] Alpha standard excludes radon and uranium, however, the WVDP results include these isotopes.
[d] Beta standard excludes strontium and alpha emitters, however the WVDP results include these isotopes.
[e] NYSDOH or EPA potable water MCL

TABLE B-6B
2007 Water Quality Results in Potable Water at the WVDP

Analyte	*Units*	*N*	*WNDNKMP*	*WNDNKEL*	*Standard* [a]
			Annual	*Annual*	
Gross Alpha	µCi/mL	1	-0.85±4.26E-10	-1.13±8.70E-10	1.5E-08
Gross Beta	µCi/mL	1	1.72±0.71E-09	1.86±0.81E-09	5E-08
Tritium	µCi/mL	2	5.91±6.88E-08	5.58±3.22E-08	2E-05
Conductivity	µmhos/cm@25°C	1	173	176	--
Haloacetic Acids-Five (5)	mg/L	2	--	0.007	0.06
pH	SU	1	8.31	8.20	--
Total Trihalomethanes	mg/L	2	--	0.022	0.08

N - Number of samples
-- No guideline or standard available for these analytes
[a] New York State Department of Health MCLs for drinking water used as a comparative reference

TABLE B-6C

2007 Water Quality Results in Utility Room Potable Water (WNDNKUR)

Analyte	*Units*	*N*	*WNDNKUR Concentrations*			*Standard or Guideline*[a]
			Minimum	*Average*	*Maximum*	
Gross Alpha	µCi/mL	11	<2.67E-10	0.78±6.66E-10	<1.26E-09	1.5E-08
Gross Beta	µCi/mL	11	1.12E-09	2.01±0.75E-09	6.75E-09	5E-08
Tritium	µCi/mL	11	<3.16E-08	2.07±5.62E-08	6.54E-08	2E-05
Antimony, Total	mg/L	1	NA	NA	<0.0004	0.006
Arsenic, Total	mg/L	1	NA	NA	<0.001	0.05
Barium, Total	mg/L	1	NA	NA	<0.20	2.00
Beryllium, Total	mg/L	1	NA	NA	<0.0003	0.004
Cadmium, Total	mg/L	1	NA	NA	<0.0010	0.005
Chromium, Total	mg/L	1	NA	NA	<0.007	0.10
Conductivity	µmhos/cm@25^{o}C	12	117	223	290	--
Cyanide, Total	mg/L	1	NA	NA	<0.01	0.2
Fluoride	mg/L	1	NA	NA	<0.20	2.2
Free Residual Chlorine	mg/L	1,092	0.10	NA	2.20	0.2–4.0
Iron, Total	mg/L	1	NA	NA	<0.05	0.3
Manganese, Total	mg/L	1	NA	NA	<0.01	--
Mercury, Total	mg/L	1	NA	NA	<0.0002	0.002
Nickel, Total	mg/L	1	NA	NA	<0.005	--
pH	SU	12	7.96	8.13	8.42	--
POC[b]	mg/L	1	NA	NA	ND	0.0005
Selenium, Total	mg/L	1	NA	NA	<0.002	0.05
Thallium, Total	mg/L	1	NA	NA	<0.0003	0.0005
Turbidity	NTU	2,184	0.1	NA	1.3	1.0[c]
Zinc, Total	mg/L	1	NA	NA	<0.01	--

N - Number of samples
NA - Not applicable, constituents sampled annually
ND - Compounds not detected
-- No guideline or standard available for these analytes
[a] New York State Department of Health MCLs for drinking water or EPA MCLGs, whichever is more stringent
[b] Principal Organic Contaminant
[c] A treatment standard of 0.3 NTU applies to the 95th percentile on a monthly basis.

TABLE B-6D

2007 Water Quality Results in Utility Room Raw (Untreated) Water (WNURRAW)

Analyte	*Units*	*N*	*WNURRAW Concentrations*		
			Minimum	*Average*	*Maximum*
Gross Alpha	µCi/mL	1	NA	-0.74±1.14E-08	NA
Gross Beta	µCi/mL	1	NA	1.47±1.24E-08	NA
Tritium	µCi/mL	1	NA	-1.70±3.52E-07	NA
Iron, Total	mg/L	53	0.1	0.68	8.33
Solids, Total Dissolved	mg/L	19	87	123	166

N - Number of samples
NA - Not applicable, constituents sampled annually

TABLE B-6E
2007 Biological and Chlorine Results in Tap Water From Various Site Locations
(Analyzed by Cattaraugus County Health Department)

Analyte	*Units*	*N*	*Various Site Tap Water Locations Results*	*Standard* [a]
E. coli	NA	12	Negative	one positive sample
Free Residual Chlorine	mg/L	12	Range: 0.01–1.20	4.0 (max)
Total Coliform	NA	12	Negative	two or more positive samples

N - Number of samples
NA - Not applicable
[a] New York State Department of Health MCLs for drinking water or EPA MCLGs, whichever is more stringent

TABLE B-6F
2007 Nitrate Results in Tap Water From WVDP Restroom Sink
(Analyzed by Cattaraugus County Health Department)

Analyte	*Units*	*N*	*Date Collected*	*Annual Concentration*	*Standard* [a]
Nitrate-N	mg/L	1	03/07/07	<1.00	10

N - Number of samples
[a] New York State Department of Health MCLs for drinking water or EPA MCLGs, whichever is more stringent

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APPENDIX C

Summary of Air Monitoring Data

TABLE C-1
2007 Effluent Airborne Radioactivity at Main Stack (ANSTACK)

Isotope [a]	*N*	*Total Activity Released* [b] *(Ci)*	*Average Concentration (µCi/mL)*	*Maximum Concentration (µCi/mL)*	*DCG* [c] *(µCi/mL)*	*Ratio of Concentration to DCG*
Gross Alpha	26	5.90±0.67E-07	7.95±0.91E-16	1.89E-15	--	--
Gross Beta	26	1.28±0.02E-05	1.73±0.03E-14	7.11E-14	--	--
H-3	26	2.07±0.04E-03	2.79±0.01E-12	1.60E-11	1E-07	<0.0001
Co-60	2	2.89±3.72E-08	3.90±5.02E-17	<6.45E-17	8E-11	<0.0001
Sr-90	2	2.25±0.16E-06	3.04±0.21E-15	4.02E-15	9E-12	0.0003
I-129	2	2.72±0.21E-05	3.66±0.28E-14	3.75E-14	7E-11	0.0005
Cs-137	2	4.56±0.26E-06	6.14±0.35E-15	6.47E-15	4E-10	<0.0001
Eu-154	2	-0.03±1.23E-07	-0.04±1.65E-16	<2.40E-16	5E-11	<0.0001
U-232 [d]	2	4.77±4.99E-09	6.42±6.73E-18	9.65E-18	2E-14	<0.0003
U-233/234 [d]	2	2.54±0.74E-08	3.42±1.00E-17	3.93E-17	9E-14	0.0004
U-235/236 [d]	2	6.99±4.09E-09	9.42±5.51E-18	9.27E-18	1E-13	<0.0001
U-238 [d]	2	1.81±0.69E-08	2.43±0.93E-17	2.31E-17	1E-13	0.0002
Pu-238	2	5.00±1.23E-08	6.73±1.65E-17	6.20E-17	3E-14	0.0022
Pu-239/240	2	9.67±1.64E-08	1.30±0.22E-16	1.61E-16	2E-14	0.0065
Am-241	2	2.08±0.21E-07	2.80±0.29E-16	3.43E-16	2E-14	0.014
Sum of Ratios						**0.025**

N - Number of samples
-- DCGs are not specified for gross alpha and beta activity.
[a] Half-lives are listed in Table UI-4.
[b] Total volume released at 50,000 cfm = 7.42E+14 mL/year
[c] Derived concentration guides (DCGs) are listed for reference only. They are applicable to average concentrations at the site boundary but not to stack concentrations, as might be inferred from their inclusion in this table.
[d] Total Uranium: 3.14±0.15E-02 g; average = 4.23E±0.21E-11 µg/mL

TABLE C-2
2007 Effluent Airborne Radioactivity at Vitrification System HVAC (ANVITSK)

Isotope	*N*	*Total Activity Released (Ci)*	*Average Concentration (µCi/mL)*	*Maximum Concentration (µCi/mL)*	*DCG [a] (µCi/mL)*
Gross Alpha	26	-0.65±1.48E-08	-1.76±3.99E-17	<3.20E-16	--
Gross Beta	26	1.36±4.30E-07	3.65±1.16E-16	2.92E-15	--
Co-60	2	-0.41±2.04E-08	1.09±5.49E-17	<9.72E-17	8E-11
Sr-90	2	1.33±2.31E-08	3.58±6.23E-17	<9.31E-17	9E-12
I-129	2	0.00±5.53E-08	0.00±1.49E-16	<2.08E-16	7E-11
Cs-137	2	0.09±2.19E-08	0.23±5.91E-17	<9.90E-17	4E-10
Eu-154	2	1.82±5.96E-08	0.49±1.61E-16	<2.88E-16	5E-11
U-232[b]	2	0.90±1.70E-09	2.43±4.57E-18	<7.01E-18	2E-14
U-233/234[b]	2	1.21±0.38E-08	3.26±1.01E-17	3.82E-17	9E-14
U-235/236[b]	2	2.13±1.81E-09	5.75±4.88E-18	8.23E-18	1E-13
U-238[b]	2	7.59±3.00E-09	2.05±0.81E-17	2.37E-17	1E-13
Pu-238	2	0.25±1.05E-09	0.68±2.83E-18	<4.40E-18	3E-14
Pu-239/240	2	3.77±9.87E-10	1.02±2.66E-18	<4.45E-18	2E-14
Am-241	2	1.44±1.45E-09	3.88±3.91E-18	<7.27E-18	2E-14

N - Number of samples
-- DCGs are not specified for gross alpha and beta activity.
[a] Derived concentration guides (DCGs) are listed for reference only. They are applicable to average concentrations at the site boundary but not to stack concentrations, as might be inferred from their inclusion in this table.
[b] Total Uranium: 1.84±0.06E-02 g; average = 4.96±0.15E-11 µg/mL

TABLE C-3
2007 Effluent Airborne Radioactivity at 01-14 Building (ANCSSTK)

Isotope	*N*	*Total Activity Released (Ci)*	*Average Concentration (µCi/mL)*	*Maximum Concentration (µCi/mL)*	*DCG [a] (µCi/mL)*
Gross Alpha	26	-1.01±0.53E-09	-7.03±3.69E-17	<2.60E-16	--
Gross Beta	26	-0.38±1.61E-08	-0.27±1.12E-16	1.67E-15	--
Co-60	2	3.89±4.90E-09	2.70±3.40E-17	<4.89E-17	8E-11
Sr-90	2	0.40±8.47E-09	0.28±5.88E-17	<9.26E-17	9E-12
I-129	2	4.40±3.57E-08	3.06±2.48E-16	<4.23E-16	7E-11
Cs-137	2	4.09±7.74E-09	2.84±5.38E-17	<7.68E-17	4E-10
Eu-154	2	-0.47±1.44E-08	-0.32±1.00E-16	<1.54E-16	5E-11
U-232[b]	2	-0.19±5.71E-09	-0.13±3.97E-17	<7.77E-17	2E-14
U-233/234[b]	2	6.03±2.93E-09	4.19±2.03E-17	5.25E-17	9E-14
U-235/236[b]	2	2.53±1.87E-09	1.76±1.30E-17	1.06E-17	1E-13
U-238[b]	2	6.53±2.88E-09	4.54±2.00E-17	7.16E-17	1E-13
Pu-238	2	-0.79±4.62E-10	-0.55±3.21E-18	<5.45E-18	3E-14
Pu-239/240	2	-0.71±6.11E-10	-0.50±4.24E-18	<5.97E-18	2E-14
Am-241	2	-6.21±9.74E-10	-4.31±6.76E-18	<1.09E-17	2E-14

N - Number of samples
-- DCGs are not specified for gross alpha and beta activity.
[a] Derived concentration guides (DCGs) are listed for reference only. They are applicable to average concentrations at the site boundary but not to stack concentrations, as might be inferred from their inclusion in this table.
[b] Total Uranium: 8.67±0.42E-03 g; average = 6.02±0.29E-11 µg/mL

TABLE C-4
2007 Effluent Airborne Radioactivity at Contact Size-Reduction Facility (ANCSRFK)

Ventilation Off; System Did Not Operate During CY 2007

TABLE C-5
2007 Effluent Airborne Radioactivity at Supernatant Treatment System (ANSTSTK)

Isotope	*N*	*Total Activity Released (Ci)*	*Average Concentration (µCi/mL)*	*Maximum Concentration (µCi/mL)*		*DCG [a] (µCi/mL)*
Gross Alpha	26	-2.99±2.88E-09	-4.48±4.31E-17	<3.09E-16		--
Gross Beta	26	-4.29±8.19E-09	-0.64±1.23E-16	<6.78E-16		--
H-3	26	2.97±0.60E-05	4.44±9.05E-13	1.76E-12		1E-07
Co-60	2	-1.10±3.84E-09	-1.64±5.75E-17	<8.74E-17		8E-11
Sr-90	2	-0.34±3.98E-09	-0.51±5.95E-17	<7.81E-17		9E-12
I-129	2	7.56±0.50E-06	1.13±0.08E-13	1.13E-13		7E-11
Cs-137	2	3.45±3.38E-09	5.17±5.06E-17	<7.59E-17		4E-10
Eu-154	2	0.28±1.93E-08	0.42±2.89E-16	<4.75E-16		5E-11
U-232[b]	2	-0.01±1.00E-09	-0.02±1.50E-17	<2.47E-17		2E-14
U-233/234[b]	2	2.36±0.76E-09	3.53±1.13E-17	4.00E-17		9E-14
U-235/236[b]	2	3.49±3.32E-10	5.23±4.97E-18	<6.04E-18		1E-13
U-238[b]	2	1.84±0.70E-09	2.76±1.05E-17	3.00E-17		1E-13
Pu-238	2	-1.62±2.54E-10	-2.42±3.80E-18	<5.02E-18		3E-14
Pu-239/240	2	-2.03±2.78E-10	-3.05±4.17E-18	<5.12E-18		2E-14
Am-241	2	7.68±4.29E-10	1.15±0.64E-18	1.87E-17		2E-14

N - Number of samples
-- DCGs are not specified for gross alpha and beta activity.
[a] Derived concentration guides (DCGs) are listed for reference only. They are applicable to average concentrations at the site boundary but not to stack concentrations, as might be inferred from their inclusion in this table.
[b] Total Uranium: 3.59±0.15E-03 g; average = 5.37±2.21E-11 µg/mL

TABLE C-6
2007 Effluent Airborne Radioactivity at Container Sorting and Packaging Facility (ANCSPFK)

Isotope	N	Total Activity Released (Ci)	Average Concentration (µCi/mL)	Maximum Concentration (µCi/mL)	DCG [a] (µCi/mL)
Gross Alpha	26	-4.66±0.67E-09	-2.64±0.38E-16	<3.08E-16	--
Gross Beta	26	4.24±2.03E-09	2.40±1.15E-16	1.89E-15	--
Co-60	2	4.55±5.30E-10	2.57±3.00E-17	<4.72E-17	8E-11
Sr-90	2	9.27±9.21E-10	5.25±5.21E-17	<8.26E-17	9E-12
I-129	2	2.40±7.34E-08	1.36±0.42E-15	2.59E-15	7E-11
Cs-137	2	-0.34±6.08E-10	-0.19±3.44E-17	<6.01E-17	4E-10
Eu-154	2	0.15±1.47E-09	0.83±8.32E-17	<1.35E-16	5E-11
U-232[b]	2	2.85±5.65E-11	1.61±3.19E-18	3.20E-18	2E-14
U-233/234[b]	2	2.58±1.16E-10	1.46±0.66E-17	2.19E-17	9E-14
U-235/236[b]	2	1.22±0.93E-10	6.92±5.28E-18	1.02E-17	1E-13
U-238[b]	2	1.77±1.16E-10	1.00±0.66E-17	1.17E-17	1E-13
Pu-238	2	3.75±5.20E-11	2.12±2.94E-18	<4.31E-18	3E-14
Pu-239/240	2	2.96±6.17E-11	1.68±3.49E-18	<6.08E-18	2E-14
Am-241	2	4.35±9.60E-11	2.46±5.43E-18	<9.44E-18	2E-14

N - Number of samples
-- DCGs are not specified for gross alpha and beta activity.
[a] Derived concentration guides (DCGs) are listed for reference only. They are applicable to average concentrations at the site boundary but not to stack concentrations, as might be inferred from their inclusion in this table.
[b] Total Uranium: 8.87±0.39E-04 g; average = 5.02±0.22E-12 µg/mL

TABLE C-7
2007 Effluent Airborne Radioactivity at Outdoor Ventilation Enclosures/Portable Ventilation Units (OVEs/PVUs)

Isotope	N	Total Activity Released (Ci)	Average Concentration (µCi/mL)	Maximum Concentration (µCi/mL)	DCG [a] (µCi/mL)
Gross Alpha	54	-2.37±2.24E-09	-5.90±5.56E-17	<4.54E-16	--
Gross Beta	54	-7.51±6.49E-09	-1.87±1.61E-16	1.49E-15	--
Co-60	2	-0.07±2.32E-09	-0.18±5.76E-17	<7.91E-17	8E-11
Sr-90	2	0.17±2.10E-09	0.42±5.21E-17	<6.94E-17	9E-12
Cs-137	2	0.68±2.11E-09	1.68±5.23E-17	<7.21E-17	4E-10
Eu-154	2	-1.91±8.47E-09	0.48±2.10E-16	<2.92E-16	5E-11
U-232[b]	2	2.25±1.32E-10	5.59±3.28E-18	6.94E-18	2E-14
U-233/234[b]	2	9.51±2.92E-10	2.36±0.73E-17	2.50E-17	9E-14
U-235/236[b]	2	2.81±1.73E-10	6.97±4.29E-18	7.69E-18	1E-13
U-238[b]	2	1.01±0.31E-09	2.50±0.76E-17	2.25E-17	1E-13
Pu-238	2	-5.20±5.69E-11	-1.29±1.41E-18	<2.42E-18	3E-14
Pu-239/240	2	0.71±1.10E-10	1.77±2.73E-18	<4.18E-18	2E-14
Am-241	2	2.21±2.00E-10	5.48±4.97E-18	<6.37E-18	2E-14

N - Number of samples
-- DCGs are not specified for gross alpha and beta activity.
[a] Derived concentration guides (DCGs) are listed for reference only. They are applicable to average concentrations at the site boundary but not to stack concentrations, as might be inferred from their inclusion in this table.
[b] Total Uranium: 2.70±0.06E-03 g; average = 6.70±0.15E-11 µg/mL

TABLE C-8
2007 Effluent Airborne Radioactivity at Remote-Handled Waste Facility Stack (ANRHWFK)

Isotope	N	Total Activity Released (Ci)	Average Concentration (µCi/mL)	Maximum Concentration (µCi/mL)	DCG [a] (µCi/mL)
Gross Alpha	26	-1.54±0.75E-08	-1.30±0.63E-16	<3.13e-16	--
Gross Beta	26	-1.91±2.28E-08	-1.62±1.94E-16	6.79E-16	--
Co-60	2	0.33±1.15E-08	2.78±9.77E-17	<1.11E-16	8E-11
Sr-90	2	0.99±1.05E-08	8.37±8.91E-17	9.72E-17	9E-12
I-129	2	3.09±0.62E-07	2.63±5.29E-15	4.95E-15	7E-11
Cs-137	2	0.72±1.66E-08	0.61±1.41E-16	<1.75E-16	4E-10
Eu-154	2	0.44±3.40E-08	0.37±2.89E-16	<2.96E-16	5E-11
U-232 [b]	2	-0.10±1.21E-09	-0.09±1.03E-17	<9.87E-18	2E-14
U-233/234 [b]	2	4.04±1.94E-09	3.44±1.65E-17	2.70E-17	9E-14
U-235/236 [b]	2	1.76±1.26E-09	1.50±1.07E-17	<9.96E-18	1E-13
U-238 [b]	2	3.27±1.54E-09	2.78±1.31E-17	2.40E-17	1E-13
Pu-238	2	3.73±7.66E-10	3.17±6.514E-18	<7.37E-18	3E-14
Pu-239/240	2	7.01±9.04E-10	5.96±7.68E-18	<7.36E-18	2E-14
Am-241	2	0.06±1.15E-09	0.48±9.76E-18	<8.92E-18	2E-14

N - Number of samples
-- DCGs are not specified for gross alpha and beta activity.
[a] Derived concentration guides (DCGs) are listed for reference only. They are applicable to average concentrations at the site boundary but not to stack concentrations, as might be inferred from their inclusion in this table.
[b] Total Uranium: 9.93±0.54E-03 g; average = 8.44±0.46E-11 µg/mL

TABLE C-9
2007 Ambient Airborne Radioactivity at Lag Storage (ANLAGAM)

Isotope	N	ANLAGAM µCi/mL Average	ANLAGAM µCi/mL Maximum	N	AFGRVAL [a] µCi/mL Background Range	DCG [b]
Gross Alpha	26	9.00±4.62E-16	1.27E-15	25	<3.84E-16-2.04E-15	--
Gross Beta	26	1.90±0.16E-14	2.82E-14	25	1.05E-14-2.94E-14	--
K-40	2	6.50±9.19E-16	1.30E-15	2	<2.04E-15-3.60E-15	9E-10
Co-60	2	3.57±4.50E-17	<4.74E-17	2	<1.36E-16-<1.63E-16	8E-11
Sr-90	2	-2.98±7.86E-17	<9.36E-17	2	<9.28E-17-<1.02E-16	9E-12
Cs-137	2	3.09±3.90E-17	<3.94E-17	2	<1.11E-16-<1.72E-16	4E-10
Eu-154	2	0.09±1.15E-16	<1.22E-16	2	<3.69E-16-<4.28E-16	5E-11
U-232 [c]	2	1.67±2.18E-17	8.85E-18	2	<1.26E-17-<3.04E-17	2E-14
U-233/234 [c]	2	2.98±1.35E-17	3.14E-17	2	4.45E-17-5.34E-17	9E-14
U-235/236 [c]	2	1.90±4.19E-18	7.09E-18	2	<1.33E-17-1.47E-17	1E-13
U-238 [c]	2	2.54±1.33E-17	3.35E-17	2	2.69E-17-2.70E-17	1E-13
Pu-238	2	0.77±4.01E-18	<4.97E-18	2	<6.65E-18-<1.11E-17	3E-14
Pu-239/240	2	1.88±7.59E-18	<9.63E-18	2	<8.36E-18-<8.81E-18	2E-14
Am-241	2	0.56±6.62E-18	<7.72E-18	2	<7.09E-18-<9.96E-18	2E-14

N - Number of samples
-- DCGs are not specified for gross alpha and beta activity.
[a] Background air sampling location
[b] Derived concentration guides (DCGs) are applicable to average concentrations at the site boundary.
[c] Total Uranium: ANLAGAM average = 5.64±0.31E-11 µg/mL; AFGRVAL average = 1.10±0.04E-10 µg/mL

TABLE C-10
2007 Ambient Airborne Radioactivity at Rock Springs Road (AFRSPRD)

Isotope	*N*	*AFRSPRD µCi/mL*		*N*	*AFGRVAL[a] µCi/mL*	*DCG[b]*
		Average	*Maximum*		*Background Range*	
Gross Alpha	26	8.90±5.98E-16	1.70E-15	25	<3.84E-16-2.04E-15	--
Gross Beta	26	2.05±0.22E-14	3.21E-14	25	1.05E-14-2.94E-14	--
K-40	2	2.88±1.58E-15	3.79E-15	2	<2.04E-15-3.60E-15	9E-10
Co-60	2	-0.04±1.54E-16	<2.07E-16	2	<1.36E-16-<1.63E-16	8E-11
Sr-90	2	-0.63±1.29E-16	<1.30E-16	2	<9.28E-17-<1.02E-16	9E-12
I-129	2	0.00±4.13E-15	<5.84E-15	2	6.84E-17-6.84E-17	7E-11
Cs-137	2	-0.63±1.20E-16	<1.60E-16	2	<1.11E-16-<1.72E-16	4E-10
Eu-154	2	-0.41±4.42E-16	<5.98E-16	2	<3.69E-16-<4.28E-16	5E-11
U-232[c]	2	0.65±1.20E-17	<1.34E-17	2	<1.26E-17-<3.04E-17	2E-14
U-233/234[c]	2	4.10±1.93E-17	4.59E-17	2	4.45E-17-5.34E-17	9E-14
U-235/236[c]	2	8.84±8.86E-18	1.30E-17	2	<1.33E-17-1.47E-17	1E-13
U-238[c]	2	3.11±1.70E-17	3.88E-17	2	2.69E-17-2.70E-17	1E-13
Pu-238	2	1.58±6.65E-18	<8.23E-18	2	<6.65E-18-<1.11E-17	3E-14
Pu-239/240	2	0.24±1.07E-17	<1.15E-17	2	<8.36E-18-<8.81E-18	2E-14
Am-241	2	1.24±1.55E-17	2.27E-17	2	<7.09E-18-<9.96E-18	2E-14

N - Number of samples
-- DCGs are not specified for gross alpha and beta activity.
[a] Background air sampling location
[b] Derived concentration guides (DCGs) are applicable to average concentrations at the site boundary.
[c] Total Uranium: AFRSPRD average = 1.09±0.07E-10 µg/mL; AFGRVAL average = 1.10±0.04E-10 µg/mL

TABLE C-11
2007 Ambient Airborne Radioactivity at Fox Valley Road (AFFXVRD)

Isotope	*N*	*AFFXVRD µCi/mL*		*N*	*AFGRVAL[a] µCi/mL*	*DCG[b]*
		Average	*Maximum*		*Background Range*	
Gross Alpha	26	8.42±5.70E-16	1.51E-15	25	<3.84E-16-2.04E-15	--
Gross Beta	26	1.94±0.21E-14	2.85E-14	25	1.05E-14-2.94E-14	--
K-40	2	3.22±1.52E-15	3.44E-15	2	<2.04E-15-3.60E-15	9E-10
Co-60	2	-0.29±1.24E-16	<1.64E-16	2	<1.36E-16-<1.63E-16	8E-11
Sr-90	2	-0.49±1.16E-16	<1.31E-16	2	<9.28E-17-<1.02E-16	9E-12
Cs-137	2	0.07±8.46E-17	<1.06E-16	2	<1.11E-16-<1.72E-16	4E-10

N - Number of samples
-- DCGs are not specified for gross alpha and beta activity.
[a] Background air sampling location
[b] Derived concentration guides (DCGs) are applicable to average concentrations at the site boundary.

TABLE C-12
2007 Ambient Airborne Radioactivity at Route 240 (AFRT240)

Isotope	N	AFRT240 µCi/mL Average	AFRT240 µCi/mL Maximum	N	AFGRVAL[a] µCi/mL Background Range	DCG[b]
Gross Alpha	26	7.93±5.45E-16	1.39E-15	25	<3.84E-16-2.04E-15	--
Gross Beta	26	1.91±0.20E-14	2.79E-14	25	1.05E-14-2.94E-14	--
K-40	2	0.46±1.59E-15	2.20E-15	2	<2.04E-15-3.60E-15	9E-10
Co-60	2	0.35±1.23E-16	<1.65E-16	2	<1.36E-16-<1.63E-16	8E-11
Sr-90	2	-0.55±1.10E-16	<1.34E-16	2	<9.28E-17-<1.02E-16	9E-12
Cs-137	2	-0.09±1.10E-16	<1.48E-16	2	<1.11E-16-<1.72E-16	4E-10

N - Number of samples
-- DCGs are not specified for gross alpha and beta activity.
[a] Background air sampling location
[b] Derived concentration guides (DCGs) are applicable to average concentrations at the site boundary.

TABLE C-13
2007 Ambient Airborne Radioactivity at West Valley (AFWEVAL)

Isotope	N	AFWEVAL µCi/mL Average	AFWEVAL µCi/mL Maximum	N	AFGRVAL[a] µCi/mL Background Range	DCG[b]
Gross Alpha	26	8.40±5.63E-16	1.47E-15	25	<3.84E-16-2.04E-15	--
Gross Beta	26	1.84±0.20E-14	2.93E-14	25	1.05E-14-2.94E-14	--
K-40	2	1.29±1.59E-15	1.81E-15	2	<2.04E-15-3.60E-15	9E-10
Co-60	2	0.54±1.56E-16	<1.78E-16	2	<1.36E-16-<1.63E-16	8E-11
Sr-90	2	0.86±1.14E-16	<1.19E-16	2	<9.28E-17-<1.02E-16	9E-12
Cs-137	2	-0.30±1.21E-16	<1.58E-16	2	<1.11E-16-<1.72E-16	4E-10

N - Number of samples
-- DCGs are not specified for gross alpha and beta activity.
[a] Background air sampling location
[b] Derived concentration guides (DCGs) are applicable to average concentrations at the site boundary.

TABLE C-14
2007 Ambient Airborne Radioactivity at Springville (AFSPRVL)

Isotope	N	AFSPRVL µCi/mL Average	AFSPRVL µCi/mL Maximum	N	AFGRVAL[a] µCi/mL Background Range	DCG[b]
Gross Alpha	26	9.99±6.09E-16	1.45E-15	25	<3.84E-16-2.04E-15	--
Gross Beta	26	2.00±0.21E-14	3.00E-14	25	1.05E-14-2.94E-14	--
K-40	2	0.00±1.83E-15	<2.11E-15	2	<2.04E-15-3.60E-15	9E-10
Co-60	2	0.33±1.32E-16	<1.49E-16	2	<1.36E-16-<1.63E-16	8E-11
Sr-90	2	5.32±9.35E-17	1.03E-16	2	<9.28E-17-<1.02E-16	9E-12
Cs-137	2	-0.16±1.13E-16	<1.32E-16	2	<1.11E-16-<1.72E-16	4E-10

N - Number of samples
-- DCGs are not specified for gross alpha and beta activity.
[a] Background air sampling location
[b] Derived concentration guides (DCGs) are applicable to average concentrations at the site boundary.

TABLE C-15
2007 Radioactivity in Fallout: Rain Gauge (ANRGFOP)

Analyte	*Units*	*N*	*Minimum*	*Average*	*Maximum*
Gross Alpha	nCi/m^2	11	2.05E-02	8.13±1.48E-02	1.94E-01
Gross Beta	nCi/m^2	11	9.18E-02	4.70±0.37E-01	9.51E-01
H-3	µCi/mL	11	1.06E-07	3.37±7.90E-08	1.47E-07
K-40	nCi/m^2	11	<2.82E-01	1.11±7.47E+00	<1.53E+01
Cs-137	nCi/m^2	11	<4.43E-02	0.68±5.89E-01	<1.24E+00

N - Number of samples

APPENDIX D

Summary of Groundwater Monitoring Data

Groundwater Sampling Methodology

Groundwater samples are collected from monitoring wells using either dedicated Teflon® well bailers or bladder pumps. Bailers are used in low-yield wells; bladder pumps are used in wells with good water-yielding characteristics. This sampling equipment is dedicated to an individual well to reduce the likelihood of sample contamination from external materials or cross contamination.

To ensure that only representative groundwater is sampled, three well volumes are removed (purged) from the well before the actual samples are collected. In low-yield wells, pumping or bailing to dryness provides sufficient purging. Conductivity and pH are measured before and after sampling to confirm the geochemical stability of the groundwater during sampling.

The bailer, a tube with a check valve at the bottom, is lowered slowly into the well to minimize agitation of the water column. The bailer containing the groundwater is then withdrawn from the well and emptied into a sample container. Bladder pumps use compressed air to gently squeeze a Teflon® bladder that prevents contact with the groundwater as it is pumped into a sample container with a minimum of agitation and mixing. A check valve ensures that the water flows in only one direction.

Groundwater samples are cooled and preserved, with chemicals if required, to minimize chemical and/or biological changes after sample collection. A strict chain-of-custody protocol is followed for all samples collected by the WVDP.

Key to bolding convention:

Tables D-1 through D-7 contain a bolding convention devised to help the reader, when viewing the data, to quickly see the range of detectable measurements within a data series. A data series is a set of chemical or radionuclide measurements (e.g., gross alpha, gross beta, tritium) from a single location or from similar locations. Note that some tables contain data that should not be technically evaluated under this convention.

Results for each analyte constitute a single data series. If a radiological result is larger than the uncertainty term, the measurement is considered positive. Otherwise, a result is considered nondetectable. Chemical results preceded by "less than" (<) are considered nondetectable. The bolding convention is not applied to data series consisting of less than three values.

If all results in a data series are positive, the lowest and highest values are bolded.
If a data series contains some positive results, the highest value is bolded.
If all values in a data series are nondetectable, no values are bolded.

TABLE D-1
2007 Indicator Results From the Sand and Gravel Unit

Location Code	Hydraulic Position	p H (SU)	Conductivity (µmhos/cm@25^{0}C)	Gross Alpha (µCi/mL)	Gross Beta (µCi/mL)	Tritium (µCi/mL)
301	UP(1)	6.40	1,210	-0.95±4.51E-09	**1.50±0.71E-08**	0.03±9.92E-08
301	UP(2)	6.63	**1,155**	**3.76±2.41E-09**	8.64±5.51E-09	2.80±9.64E-08
301	UP(3)	**7.05**	2,706	0.83±1.34E-08	3.77±5.16E-09	0.55±4.59E-08
301	UP(4)	**5.89**	**3,318**	0.75±1.37E-08	0.16±1.06E-08	-3.61±4.47E-08
401	UP(1)	6.95	**4,156**	1.06±6.91E-09	1.29±1.31E-08	-2.06±0.70E-07
401	UP(2)	6.91	**3,265**	4.61±4.78E-09	1.86±4.88E-09	9.31±9.66E-08
401	UP(3)	**7.00**	3,598	-0.21±2.05E-08	0.94±1.38E-08	-0.79±4.52E-08
401	UP(4)	**6.68**	3,772	**1.46±1.43E-08**	0.23±1.50E-08	**5.86±4.46E-08**
403	UP(1)	7.04	592	5.94±2.22E-09	3.21±2.24E-09	-3.57±9.90E-08
403	UP(3)	7.12	1,312	-0.44±6.30E-09	4.50±5.76E-09	-9.18±4.41E-08
706	UP(1)	**6.73**	816	0.24±1.58E-09	6.09±5.06E-09	-0.81±1.00E-07
706	UP(2)	**6.73**	**795**	**1.45±1.34E-09**	8.08±3.85E-09	3.87±9.76E-08
706	UP(3)	6.77	1,183	-0.95±6.71E-09	**1.06±0.89E-08**	-2.91±3.26E-08
706	UP(4)	**6.82**	**1,318**	3.02±5.53E-09	1.25±8.25E-09	3.17±4.50E-08
1304	UP(1)	**6.80**	2,203	**6.92±5.42E-09**	-1.32±8.46E-09	0.03±1.01E-07
1304	UP(2)	7.10	2,855	6.14±5.67E-09	1.03±1.30E-08	3.49±9.78E-08
1304	UP(3)	7.02	**3,861**	-1.53±1.86E-08	-0.05±1.41E-08	-0.84±3.21E-08
1304	UP(4)	**7.23**	**2,017**	1.07±3.17E-09	4.23±6.16E-09	4.03±4.43E-08
NB1S	UP(1)	6.73	309	5.80±7.55E-10	-0.32±3.39E-09	-3.51±6.75E-08
NB1S	UP(3)	6.88	671	3.72±4.60E-09	0.67±3.57E-09	2.88±4.59E-08
201	DOWN(1)	6.38	3,045	5.09±8.01E-09	4.81±1.12E-08	-3.58±9.84E-08
201	DOWN(3)	6.57	3,468	-0.26±1.23E-08	4.28±1.64E-08	-7.89±4.43E-08
1302	DOWN(1)	7.08	1,355	1.90±2.48E-09	-2.05±9.38E-09	-1.53±0.99E-07
1302	DOWN(2)	7.07	**1,082**	**2.85±2.40E-09**	-1.19±2.15E-09	-0.15±9.64E-08
1302	DOWN(3)	**7.00**	2,136	-1.29±4.38E-09	-0.56±4.73E-09	-2.21±4.52E-08
1302	DOWN(4)	**7.64**	**2,338**	-1.67±3.93E-09	2.48±6.85E-09	4.04±4.44E-08
103	DOWN(1)	**8.13**	**3,444**	-0.44±1.77E-08	**5.04±1.46E-08**	7.53±9.32E-08
103	DOWN(2)	8.12	11,607	1.22±1.26E-08	3.27±0.44E-07	1.47±4.60E-08
103	DOWN(3)	7.71	**13,192**	1.30±2.21E-08	**3.56±0.37E-07**	**3.63±3.24E-08**
103	DOWN(4)	**7.64**	9,913	-0.21±2.83E-08	1.83±0.49E-07	0.18±4.53E-08
104	DOWN(1)	7.07	2,336	0.00±4.73E-09	8.30±0.21E-05	**3.77±0.69E-07**
104	DOWN(2)	7.06	**2,045**	5.77±7.54E-09	**7.56±0.39E-05**	2.24±0.49E-07
104	DOWN(3)	**7.08**	2,204	1.63±8.58E-09	9.03±0.60E-05	2.48±0.49E-07
104	DOWN(4)	**6.95**	**2,598**	-0.67±1.43E-08	**1.01±0.07E-04**	**1.57±0.34E-07**

Note: Bolding convention applied to these data. (See p. D-1.)
Sample collection quarter is noted in parentheses next to hydraulic position. Hydraulic position is relative to other wells within the same hydrogeologic unit.

TABLE D-1 *(continued)*
2007 Indicator Results From the Sand and Gravel Unit

Location Code	Hydraulic Position	pH (SU)	Conductivity (µmhos/cm@25^{0}C)	Gross Alpha (µCi/mL)	Gross Beta (µCi/mL)	Tritium (µCi/mL)
111	DOWN(1)	**6.35**	**543**	**9.37±2.98E-09**	**3.12±0.08E-06**	7.39±9.39E-08
111	DOWN(2)	6.54	678	4.48±3.89E-09	5.52±0.26E-06	**1.44±0.48E-07**
111	DOWN(3)	**6.84**	1,181	4.75±7.90E-09	8.08±0.48E-06	1.24±0.47E-07
111	DOWN(4)	6.61	**1,837**	-1.10±0.82E-08	**8.81±0.54E-06**	9.46±4.75E-08
205	DOWN(1)	7.00	2,800	0.00±1.42E-08	1.87±1.01E-08	0.19±9.91E-08
205	DOWN(3)	6.93	6,218	0.91±2.73E-08	2.35±2.47E-08	-6.43±4.46E-08
406	DOWN(1)	**6.75**	1,219	-1.15±1.98E-09	4.14±6.35E-09	5.88±9.38E-08
406	DOWN(2)	**6.75**	**1,260**	1.36±2.96E-09	5.90±1.59E-09	**4.38±0.52E-07**
406	DOWN(3)	**7.02**	858	-4.36±6.20E-09	**7.81±7.39E-09**	3.53±4.60E-08
406	DOWN(4)	6.92	**780**	-0.45±1.65E-09	3.96±3.60E-09	7.78±4.66E-08
408	DOWN(1)	**7.09**	**2,870**	-6.09±6.93E-09	3.22±0.01E-04	1.61±1.20E-07
408	DOWN(2)	7.17	3,130	0.87±3.77E-09	**3.09±0.01E-04**	9.34±8.46E-08
408	DOWN(3)	7.13	3,433	0.00±4.06E-09	3.30±0.04E-04	**1.73±1.21E-07**
408	DOWN(4)	**7.27**	**3,670**	-5.44±0.58E-08	**3.85±0.07E-04**	0.81±1.06E-07
501	DOWN(1)	7.36	**2,206**	1.69±4.80E-09	1.45±0.04E-04	**2.45±0.96E-07**
501	DOWN(2)	**7.38**	2,416	6.16±9.51E-09	**1.53±0.08E-04**	4.42±4.65E-08
501	DOWN(3)	**7.28**	2,532	1.30±1.49E-08	**1.39±0.10E-04**	5.14±4.63E-08
501	DOWN(4)	7.36	**2,852**	-0.18±1.61E-08	1.48±0.08E-04	4.35±4.62E-08
502	DOWN(1)	7.35	2,432	-3.69±3.82E-09	**1.75±0.04E-04**	**1.88±0.96E-07**
502	DOWN(2)	**7.44**	**2,405**	**1.46±1.21E-08**	1.62±0.09E-04	5.16±4.66E-08
502	DOWN(3)	**7.26**	2,442	0.77±1.42E-08	1.58±0.12E-04	5.43±4.56E-08
502	DOWN(4)	7.29	**2,673**	0.21±1.27E-08	**1.55±0.08E-04**	1.37±4.57E-08
602A	DOWN(1)	6.91	657	0.85±1.56E-09	**1.26±0.41E-08**	**2.99±0.97E-07**
602A	DOWN(2)	**7.02**	**632**	**1.93±1.31E-09**	1.12±0.32E-08	1.84±0.99E-07
602A	DOWN(3)	6.79	686	0.81±4.00E-09	**8.13±4.02E-09**	**1.13±0.47E-07**
602A	DOWN(4)	**6.62**	**736**	-0.36±1.32E-09	1.24±0.34E-08	2.01±0.49E-07
604	DOWN(1)	**6.30**	1,262	0.67±7.00E-09	5.84±5.13E-09	4.31±9.45E-08
604	DOWN(2)	**6.30**	**898**	-0.87±1.27E-09	**3.38±2.05E-09**	-1.29±4.55E-08
604	DOWN(3)	**6.01**	1,182	-0.69±2.34E-09	4.80±4.33E-09	1.66±4.55E-08
604	DOWN(4)	6.15	**1,386**	0.00±2.58E-09	**8.44±4.28E-09**	0.06±4.52E-08
8605	DOWN(1)	**6.82**	1,402	8.88±3.34E-09	9.86±0.18E-06	1.22±0.96E-07
8605	DOWN(2)	6.72	1,885	**1.08±1.03E-08**	9.59±0.50E-06	1.12±0.47E-07
8605	DOWN(3)	**6.68**	**1,244**	4.42±8.23E-09	**1.00±0.07E-05**	**1.35±0.47E-07**
8605	DOWN(4)	6.69	**2,990**	-1.57±9.55E-09	**4.59±0.25E-06**	**1.09±0.34E-07**
8607	DOWN(1)	**6.58**	**675**	**2.21±2.19E-09**	**1.38±0.36E-08**	4.48±9.49E-08
8607	DOWN(2)	**6.35**	1,358	0.22±1.75E-09	2.80±0.47E-08	**5.21±4.70E-08**
8607	DOWN(3)	6.37	**3,350**	-1.48±1.69E-08	**3.07±0.87E-08**	1.27±4.53E-08
8607	DOWN(4)	6.36	2,723	1.33±8.05E-09	2.33±1.11E-08	2.18±4.57E-08

Note: Bolding convention applied to these data. (See p. D-1.)
Sample collection quarter is noted in parentheses next to hydraulic position. Hydraulic position is relative to other wells within the same hydrogeologic unit.

TABLE D-1 *(continued)*
2007 Indicator Results From the Sand and Gravel Unit

Location Code	Hydraulic Position	pH (SU)	Conductivity (µmhos/cm@25°C)	Gross Alpha (µCi/mL)	Gross Beta (µCi/mL)	Tritium (µCi/mL)
8609	DOWN(1)	7.01	2,113	1.19±4.96E-09	**2.12±0.07E-06**	**3.12±0.99E-07**
8609	DOWN(2)	**7.03**	**2,054**	-0.31±6.45E-09	**1.66±0.07E-06**	**2.26±0.50E-07**
8609	DOWN(3)	6.96	2,232	0.29±9.52E-09	1.96±0.16E-06	2.54±0.49E-07
8609	DOWN(4)	**6.76**	**2,424**	-0.47±1.05E-08	2.01±0.09E-06	2.88±0.50E-07
105	DOWN(1)	7.21	2,404	-0.58±4.37E-09	8.66±0.20E-05	**2.66±0.95E-07**
105	DOWN(2)	7.21	**2,254**	0.60±1.02E-08	**7.84±0.42E-05**	2.39±0.49E-07
105	DOWN(3)	**7.30**	2,298	-0.23±1.15E-08	8.26±0.62E-05	2.13±0.49E-07
105	DOWN(4)	**7.14**	**2,435**	0.31±1.44E-08	**8.78±0.56E-05**	**1.76±0.48E-07**
106	DOWN(1)	6.85	**1,604**	-0.72±7.01E-09	**2.71±0.12E-07**	**1.64±0.87E-07**
106	DOWN(2)	**6.97**	1,834	**1.31±0.29E-08**	4.01±0.16E-07	3.31±1.05E-07
106	DOWN(3)	6.96	**1,922**	-1.93±2.17E-09	**4.76±0.19E-07**	6.32±0.55E-07
106	DOWN(4)	**6.65**	1,860	8.60±8.83E-09	3.83±0.28E-07	**9.89±0.60E-07**
116	DOWN(1)	**7.10**	**1,688**	1.90±3.72E-09	**4.90±0.14E-06**	1.56±0.96E-07
116	DOWN(2)	**6.74**	1,840	7.85±8.93E-09	6.35±0.33E-06	**1.16±0.48E-07**
116	DOWN(3)	**7.10**	2,104	2.45±6.60E-09	8.02±0.52E-06	**1.71±0.48E-07**
116	DOWN(4)	6.92	**2,313**	-0.76±1.28E-08	**9.51±0.72E-06**	1.62±0.48E-07
605	DOWN(1)	7.00	587	-3.41±9.45E-10	2.38±0.48E-08	0.65±7.07E-08
605	DOWN(3)	6.93	978	1.13±0.32E-08	2.68±0.61E-08	-6.42±4.45E-08
801	DOWN(1)	**6.71**	**1,224**	1.33±2.91E-09	**1.27±0.03E-05**	8.72±9.48E-08
801	DOWN(2)	**6.71**	1,486	1.16±5.64E-09	1.40±0.08E-05	5.70±4.66E-08
801	DOWN(3)	6.69	1,646	-0.59±9.06E-09	**1.44±0.12E-05**	**1.55±0.34E-07**
801	DOWN(4)	**6.60**	**1,732**	-8.79±9.54E-09	1.38±0.07E-05	1.11±0.47E-07
802	DOWN(1)	**6.42**	272	2.68±6.39E-10	1.80±0.32E-08	0.38±1.01E-07
802	DOWN(2)	6.44	**150**	7.80±9.54E-10	**1.20±0.39E-08**	-0.30±4.65E-08
802	DOWN(3)	**6.93**	437	**1.66±0.18E-08**	6.84±0.48E-08	-4.95±4.47E-08
802	DOWN(4)	6.88	**1,548**	6.08±7.16E-09	**2.84±0.24E-07**	**1.18±0.32E-07**
803	DOWN(1)	**7.03**	1,256	0.36±5.39E-09	**2.50±0.83E-08**	-3.59±1.22E-07
803	DOWN(2)	7.01	**1,204**	1.70±3.69E-09	2.38±1.15E-08	9.74±4.72E-08
803	DOWN(3)	6.74	1,245	-0.44±6.33E-09	**9.10±7.11E-09**	-3.85±4.50E-08
803	DOWN(4)	**6.68**	**1,432**	4.78±5.39E-09	1.65±0.72E-08	**1.13±0.45E-07**
804	DOWN(1)	**6.80**	**765**	-1.70±2.89E-09	**1.28±0.11E-07**	-3.50±9.87E-08
804	DOWN(2)	6.49	**2,045**	**6.54±4.44E-09**	**3.76±0.22E-07**	**1.15±0.48E-07**
804	DOWN(3)	6.64	1,426	4.19±9.16E-09	2.63±0.24E-07	8.00±4.66E-08
804	DOWN(4)	**6.43**	1,210	1.85±5.29E-09	1.40±0.16E-07	0.37±4.59E-08
8603	DOWN(1)	7.13	2,418	2.38±5.21E-09	8.51±0.22E-05	2.30±0.97E-07
8603	DOWN(2)	7.20	**2,208**	0.89±1.08E-08	8.66±0.39E-05	**2.44±0.50E-07**
8603	DOWN(3)	**7.35**	2,300	**9.30±8.91E-09**	**9.01±0.43E-05**	1.99±0.49E-07
8603	DOWN(4)	**7.00**	**2,566**	-0.90±1.38E-08	**7.21±0.40E-05**	**1.63±0.48E-07**

Note: Bolding convention applied to these data. (See p. D-1.)
Sample collection quarter is noted in parentheses next to hydraulic position. Hydraulic position is relative to other wells within the same hydrogeologic unit.

TABLE D-1 *(concluded)*
2007 Indicator Results From the Sand and Gravel Unit

Location Code	Hydraulic Position	p H (SU)	Conductivity (µmhos/cm@25^{0}C)	Gross Alpha (µCi/mL)	Gross Beta (µCi/mL)	Tritium (µCi/mL)
8604	DOWN(1)	7.06	2,261	2.19±4.80E-09	8.33±0.21E-05	2.43±0.97E-07
8604	DOWN(3)	7.26	2,140	-0.39±1.17E-08	8.21±0.57E-05	2.03±0.48E-07
8612	DOWN(1)	7.16	**1,500**	-0.95±9.72E-09	-2.41±7.05E-09	**2.53±0.99E-07**
8612	DOWN(2)	**7.20**	1,600	**9.72±8.98E-10**	0.00±1.66E-09	2.35±1.00E-07
8612	DOWN(3)	7.15	1,588	0.00±2.85E-09	0.76±4.93E-09	**2.28±0.49E-07**
8612	DOWN(4)	**6.69**	**1,647**	0.88±6.08E-09	-4.08±6.80E-09	2.30±0.49E-07
GSEEP	DOWN(1)	**6.63**	**910**	-2.00±5.31E-09	2.45±4.89E-09	**3.24±1.07E-07**
GSEEP	DOWN(2)	**7.09**	1,017	**2.34±1.56E-09**	4.82±2.56E-09	4.02±1.01E-07
GSEEP	DOWN(3)	6.65	1,215	-1.42±5.53E-09	**6.95±4.47E-09**	3.78±0.51E-07
GSEEP	DOWN(4)	6.82	**1,318**	2.99±5.48E-09	4.96±5.53E-09	**4.72±0.52E-07**
SP04	DOWN(1)	NS	NS	-1.89±7.60E-09	**1.03±0.76E-08**	0.70±1.04E-07
SP04	DOWN(3)	NS	NS	-0.32±1.02E-08	**2.67±0.64E-08**	1.89±0.48E-07
SP04	DOWN(4)	NS	NS	-1.81±4.26E-09	2.14±0.66E-08	**3.26±0.49E-07**
SP06	DOWN(1)	NS	NS	-0.42±4.23E-09	1.52±3.66E-09	0.41±1.00E-07
SP06	DOWN(3)	NS	NS	-0.58±5.69E-09	3.71±3.17E-09	5.98±4.65E-08
SP11	DOWN(1)	**7.07**	**1,109**	-2.77±6.85E-09	**9.23±0.85E-08**	0.83±1.01E-07
SP11	DOWN(2)	6.95	1,302	**4.22±2.47E-09**	1.06±0.08E-07	**1.63±0.85E-07**
SP11	DOWN(3)	6.95	1,495	-2.59±7.06E-09	**1.32±0.11E-07**	8.03±4.64E-08
SP11	DOWN(4)	**6.75**	**1,708**	4.07±6.69E-09	1.15±0.12E-07	6.08±4.64E-08
SP12	DOWN(1)	7.44	717	0.89±4.39E-09	0.51±3.39E-09	-1.92±9.88E-08
SP12	DOWN(3)	7.32	1,062	-4.27±5.61E-09	3.22±4.96E-09	1.77±0.49E-07
WP-A	DOWN(4)	9.00	115	1.12±2.45E-10	1.22±0.11E-08	1.15±0.04E-05
WP-C	DOWN(4)	8.01	122	0.65±2.71E-10	2.47±0.15E-08	3.08±0.09E-05
WP-H	DOWN(4)	6.58	1,596	-2.44±6.01E-09	8.19±0.64E-06	3.03±0.12E-06

Note: Bolding convention applied to these data. (See p. D-1.)
NS - Not sampled
Sample collection quarter is noted in parentheses next to hydraulic position. Hydraulic position is relative to other wells within the same hydrogeologic unit.

TABLE D-2
2007 Indicator Results From the Lavery Till-Sand Unit

Location Code	Hydraulic Position	pH (SU)	Conductivity (µmhos/cm@25^{0}C)	Gross Alpha (µCi/mL)	Gross Beta (µCi/mL)	Tritium (µCi/mL)
302	UP(1)	6.73	4,632	1.15±1.55E-08	0.40±1.32E-08	0.98±1.02E-07
302	UP(3)	6.87	4,937	0.57±2.84E-08	1.28±2.46E-08	-7.53±4.44E-08
402	UP(1)	7.07	3,978	1.09±7.07E-09	1.15±1.40E-08	7.97±9.37E-08
402	UP(3)	7.03	4,162	-1.32±1.87E-08	0.21±1.30E-08	-0.89±4.53E-08
204	DOWN(1)	7.39	1,439	2.40±5.34E-09	3.46±6.54E-09	-9.58±9.71E-08
204	DOWN(2)	**7.51**	1,465	1.89±1.96E-09	0.81±2.12E-09	-1.62±9.60E-08
204	DOWN(3)	7.43	**1,414**	2.48±4.12E-09	2.61±5.20E-09	-4.43±3.20E-08
204	DOWN(4)	**7.14**	**1,506**	4.25±6.35E-09	-1.63±5.84E-09	-0.93±4.40E-08
206	DOWN(1)	7.41	1,568	1.88±9.74E-09	-3.07±7.02E-09	-6.36±9.78E-08
206	DOWN(3)	7.35	1,480	1.67±6.22E-09	-0.23±7.32E-09	-5.95±4.52E-08
208	DOWN(1)	7.67	328	1.51±1.49E-09	2.82±1.83E-09	0.72±1.01E-07
208	DOWN(3)	7.87	280	0.60±1.82E-09	0.44±1.76E-09	-6.78±4.44E-08

Note: Bolding convention applied to these data. (See p. D-1.)
Sample collection quarter is noted in parentheses next to hydraulic position. Hydraulic position is relative to other wells within the same hydrogeologic unit.

TABLE D-3
2007 Indicator Results From the Weathered Lavery Till Unit

Location Code	Hydraulic Position	pH (SU)	Conductivity (µmhos/cm@25°C)	Gross Alpha (µCi/mL)	Gross Beta (µCi/mL)	Tritium (µCi/mL)
908	UP(1)	6.84	2,565	0.77±1.52E-08	1.56±1.28E-08	0.16±1.01E-07
908	UP(3)	6.54	2,766	1.65±0.88E-08	0.94±1.04E-08	-1.04±4.53E-08
1005	UP(1)	6.95	796	2.48±5.90E-09	-1.60±4.70E-09	-0.81±1.03E-07
1005	UP(3)	7.17	757	5.63±6.11E-09	2.54±4.89E-09	-1.26±0.43E-07
1008C	UP(1)	7.45	620	-0.20±1.19E-09	3.16±3.72E-09	-2.36±1.00E-07
1008C	UP(3)	7.38	610	1.09±1.87E-09	1.07±2.58E-09	-2.22±4.51E-08
906	DOWN(1)	7.52	628	1.57±1.81E-09	5.48±3.80E-09	-0.72±1.03E-07
906	DOWN(3)	7.21	627	2.16±2.07E-09	4.31±2.77E-09	-1.02±0.44E-07
1006	DOWN(1)	6.91	1,665	0.67±1.12E-08	2.65±7.40E-09	-2.23±0.99E-07
1006	DOWN(3)	6.89	1,683	1.02±0.83E-08	2.93±7.34E-09	-9.51±4.39E-08
1007	DOWN(1)	6.87	1,318	0.16±1.12E-08	-1.33±7.20E-09	-1.76±1.02E-07
1007	DOWN(3)	6.83	1,315	5.36±7.11E-09	8.09±7.82E-09	-4.40±4.49E-08
NDATR	DOWN(1)	**7.32**	**549**	0.72±2.22E-09	**4.92±0.26E-07**	**4.36±0.71E-07**
NDATR	DOWN(2)	**8.04**	**1,015**	2.19±1.49E-09	3.61±0.14E-07	1.44±0.09E-06
NDATR	DOWN(3)	7.67	949	**4.67±4.31E-09**	**2.20±0.17E-07**	**3.46±0.13E-06**
NDATR	DOWN(4)	7.33	810	0.87±1.90E-09	3.86±0.16E-07	1.61±0.05E-06
909	DOWN(1)	6.80	1,261	0.44±2.85E-09	2.98±0.23E-07	6.94±1.04E-07
909	DOWN(2)	**6.86**	**1,194**	**2.32±2.14E-09**	**3.02±0.17E-07**	**6.53±1.06E-07**
909	DOWN(3)	6.74	1,262	-6.29±8.95E-09	**2.66±0.18E-07**	**7.22±0.56E-07**
909	DOWN(4)	**6.70**	**1,313**	-0.74±2.71E-09	2.80±0.17E-07	6.94±0.55E-07

Note: Bolding convention applied to these data. (See p. D-1.)
Sample collection quarter is noted in parentheses next to hydraulic position. Hydraulic position is relative to other wells within the same hydrogeologic unit.

TABLE D-4
2007 Indicator Results From the Unweathered Lavery Till Unit

Location Code	Hydraulic Position	p H (SU)	Conductivity (µmhos/cm@25^{0}C)	Gross Alpha (µCi/mL)	Gross Beta (µCi/mL)	Tritium (µCi/mL)
405	UP(1)	**7.24**	**954**	1.42±2.16E-09	**1.24±0.71E-08**	-1.44±0.97E-07
405	UP(2)	7.13	**2,697**	0.51±3.02E-09	6.04±5.19E-09	-0.44±9.57E-08
405	UP(3)	**7.00**	2,326	6.44±9.25E-09	1.15±1.08E-08	-1.29±0.51E-07
405	UP(4)	7.05	2,364	0.79±1.09E-08	8.20±9.16E-09	1.66±4.58E-08
1303	UP(1)	7.80	**240**	0.47±1.43E-09	2.08±2.22E-09	-2.82±9.43E-08
1303	UP(2)	**7.78**	**334**	3.86±8.37E-10	**2.64±2.56E-09**	0.24±9.71E-08
1303	UP(3)	7.84	308	-0.65±1.78E-09	0.98±2.09E-09	-4.50±4.44E-08
1303	UP(4)	**7.97**	266	0.00±5.42E-10	0.54±1.08E-09	-4.05±4.32E-08
110	DOWN(1)	**7.47**	**530**	1.70±1.62E-09	1.85±3.63E-09	**9.21±1.16E-07**
110	DOWN(2)	7.43	528	1.62±1.98E-09	1.17±1.44E-09	**1.10±0.06E-06**
110	DOWN(3)	7.38	518	-1.72±4.08E-09	0.78±4.06E-09	1.02±0.06E-06
110	DOWN(4)	**7.29**	**510**	**4.39±2.85E-09**	1.02±2.64E-09	1.05±0.06E-06
704	DOWN(1)	6.55	**732**	-0.26±5.26E-09	1.20±3.65E-09	-1.27±1.02E-07
704	DOWN(2)	6.50	949	-0.76±1.83E-09	**8.15±5.39E-09**	-0.30±3.21E-08
704	DOWN(3)	**6.46**	1,054	-1.08±2.33E-09	4.15±2.78E-09	-2.46±4.52E-08
704	DOWN(4)	**6.64**	**1,234**	0.00±3.03E-09	5.85±4.89E-09	-0.74±4.42E-08
707	DOWN(1)	6.61	**392**	0.67±1.02E-09	2.06±2.69E-09	-1.27±1.00E-07
707	DOWN(2)	**6.48**	437	1.27±1.38E-09	**7.26±3.70E-09**	-3.77±3.19E-08
707	DOWN(3)	6.62	**668**	**2.45±2.18E-09**	3.61±1.91E-09	-9.84±5.05E-08
707	DOWN(4)	**6.68**	638	0.35±1.03E-09	1.36±2.06E-09	-7.35±4.89E-08
107	DOWN(1)	7.35	**651**	1.20±3.10E-09	**1.78±0.54E-08**	-0.78±1.00E-07
107	DOWN(2)	**7.45**	695	3.13±1.68E-09	1.22±0.33E-08	1.24±0.98E-07
107	DOWN(3)	7.01	854	0.41±1.61E-09	**8.84±3.07E-09**	1.11±0.33E-07
107	DOWN(4)	**7.00**	**968**	**5.71±3.66E-09**	1.33±0.32E-08	**2.12±0.47E-07**
108	DOWN(1)	**7.81**	517	2.56±1.39E-09	-0.07±4.49E-09	-0.37±1.01E-07
108	DOWN(2)	7.68	**542**	**3.17±1.51E-09**	**1.80±1.22E-09**	**2.00±0.49E-07**
108	DOWN(3)	**7.50**	524	-0.10±2.78E-09	2.24±3.01E-09	1.71±0.48E-07
108	DOWN(4)	7.55	**482**	2.57±2.27E-09	1.63±2.52E-09	1.04±0.45E-07
409	DOWN(1)	**8.02**	**331**	0.40±1.52E-09	**3.72±2.33E-09**	2.77±9.99E-08
409	DOWN(2)	7.95	**351**	**2.05±1.23E-09**	0.95±1.40E-09	-5.16±4.50E-08
409	DOWN(3)	7.80	338	8.56±9.83E-10	2.90±1.58E-09	-1.21±0.43E-07
409	DOWN(4)	**7.75**	334	1.40±1.02E-09	1.29±1.53E-09	-0.09±3.09E-08
910	DOWN(1)	**8.07**	850	2.52±2.40E-09	4.74±0.89E-08	0.15±9.46E-08
910	DOWN(2)	7.78	**1,040**	**3.15±2.03E-09**	**3.80±0.55E-08**	-3.69±9.67E-08
910	DOWN(3)	**7.46**	1,036	2.29±1.77E-09	3.90±0.39E-08	0.08±4.51E-08
910	DOWN(4)	7.53	**801**	1.49±2.06E-09	**5.56±0.15E-07**	2.77±4.60E-08

Note: Bolding convention applied to these data. (See p. D-1.)
Sample collection quarter is noted in parentheses next to hydraulic position. Hydraulic position is relative to other wells within the same hydrogeologic unit.

TABLE D-5
2007 Indicator Results From the Kent Recessional Sequence

Location Code	Hydraulic Position	pH (SU)	Conductivity (µmhos/cm@25°C)	Gross Alpha (µCi/mL)	Gross Beta (µCi/mL)	Tritium (µCi/mL)
901	UP(1)	7.78	344	0.74±1.65E-09	5.94±2.52E-09	-2.79±9.99E-08
901	UP(3)	7.53	360	-0.70±2.71E-09	1.88±2.44E-09	-7.79±4.50E-08
902	UP(1)	7.94	413	5.44±1.98E-09	1.31±2.73E-09	-1.40±0.98E-07
902	UP(3)	8.63	334	-1.21±2.53E-09	4.92±2.63E-09	-2.92±4.49E-08
1008B	UP(1)	7.90	318	3.11±2.00E-09	2.83±2.06E-09	-2.99±0.99E-07
1008B	UP(3)	7.68	314	1.09±1.14E-09	2.05±1.53E-09	-4.70±4.48E-08
903	DOWN(1)	7.43	906	-1.44±5.76E-09	1.16±4.84E-09	-1.01±1.00E-07
903	DOWN(3)	7.28	934	-0.88±1.91E-09	3.90±3.62E-09	-7.73±4.51E-08
8610	DOWN(1)	7.80	1,116	-1.27±4.48E-09	9.91±4.96E-09	-1.84±0.71E-07
8610	DOWN(3)	7.16	1,120	1.60±6.49E-09	4.19±5.24E-09	-4.89±4.43E-08
8611	DOWN(1)	7.61	927	-2.76±3.67E-09	4.56±4.60E-09	-1.81±1.02E-07
8611	DOWN(3)	7.11	909	1.87±2.40E-09	3.25±3.45E-09	-4.73±4.41E-08

Note: Bolding convention is not applicable to these data.
Sample collection quarter is noted in parentheses next to hydraulic position. Hydraulic position is relative to other wells within the same hydrogeologic unit.

TABLE D-6
2007 Results for Metals in Groundwater
Title 6 NYCRR Appendix 33 List

Location Code	Hydraulic Position	Antimony (µg/L)	Arsenic (µg/L)	Barium (µg/L)	Beryllium (µg/L)	Cadmium (µg/L)	Chromium (µg/L)	Cobalt (µg/L)	Copper (µg/L)
Sand and Gravel									
301	UP(3)	<10	<10	296	<1	<5	63	<50	<25
301	UP(4)	<10	<10	438	<1	<5	2,490	61	59
706	UP(1)	<10	<10	114	<1	<5	155	<50	<25
706	UP(2)	<10	<10	**97**	<1	<5	**49**	<50	<25
706	UP(3)	<10	<10	151	<1	<5	136	<50	<25
706	UP(4)	<10	<10	**162**	<1	<5	**268**	<50	<25
1304	UP(1)	<10	<10	102	<1	<5	<5	<50	<25
1304	UP(2)	<10	<10	**157**	<1	<5	<5	<50	<25
1304	UP(3)	<10	<10	150	<1	<5	<5	<50	<25
1304	UP(4)	<10	<10	**84**	<1	<5	<5	<50	<25
1302	DOWN(1)	<10	<10	98	<1	<5	<5	<50	<25
1302	DOWN(2)	<10	<10	**82**	<1	<5	<5	<50	<25
1302	DOWN(3)	<10	<10	**166**	<1	<5	<5	<50	<25
1302	DOWN(4)	<10	<10	149	<1	<5	<5	<50	<25
104	DOWN(3)	<10	<10	253	<1	<5	<10	<50	<25
104	DOWN(4)	<10	<10	342	<1	<5	416	<50	<25
111	DOWN(1)	<2	<3	85	<0.1	<0.3	<1	2	2
408	DOWN(3)	<10	<10	535	<1	<5	71	<50	<25
408	DOWN(4)	<10	<10	660	<1	<5	24	<50	<25
501	DOWN(3)	<10	<10	511	<1	<5	<10	<50	<25
501	DOWN(4)	<10	<10	654	<1	<5	<10	<50	<25
502	DOWN(1)	NS	**8**	**761**	NS	<0.3	**4,800**	7	79
502	DOWN(3)	<10	<10	**567**	<1	<5	**1,590**	<50	<25
502	DOWN(4)	<10	<10	745	<1	<5	2,590	<50	30
8605	DOWN(1)	<2	4	139	<0.1	<0.3	<1	1	2
8609	DOWN(3)	<10	<10	498	<1	<5	<10	<50	<25
8609	DOWN(4)	<10	<10	545	<1	<5	<10	<50	<25
Weathered Till									
NDATR	DOWN(1)	<10	<10	**33**	<1	<5	<5	<50	<25
NDATR	DOWN(2)	<10	<10	44	<1	<5	<5	<50	<25
NDATR	DOWN(3)	<10	<10	55	<1	<5	<5	<50	<25
NDATR	DOWN(4)	<10	<10	**64**	<1	<5	<5	<50	<25
909	DOWN(1)	<10	17	198	<1	<5	6	<50	<25

Note: Bolding convention applied to these data. (See p. D-1.)

NS - Not sampled.

Sample collection quarter is noted in parentheses next to hydraulic position. Hydraulic position is relative to other wells within the same hydrogeologic unit.

TABLE D-6 *(continued)*
2007 Results for Metals in Groundwater
Title 6 NYCRR Appendix 33 List

Location Code	Hydraulic Position	Antimony (µg/L)	Arsenic (µg/L)	Barium (µg/L)	Beryllium (µg/L)	Cadmium (µg/L)	Chromium (µg/L)	Cobalt (µg/L)	Copper (µg/L)
Unweathered Till									
405	UP(1)	<10	<10	**86**	<1	<5	804	<50	<25
405	UP(2)	<10	<10	138	<1	<5	**166**	<50	<25
405	UP(3)	<10	<10	103	<1	<5	585	<50	<25
405	UP(4)	<10	<10	**182**	<1	<5	**1,080**	<50	<25
1303	UP(1)	<10	**21**	**286**	1	<5	28	<50	<25
1303	UP(2)	<10	23	375	1	<5	35	<50	37
1303	UP(3)	<10	**34**	**467**	**2**	<5	**47**	<50	**44**
1303	UP(4)	<10	22	442	1	<5	**26**	<50	42

Note: Bolding convention applied to these data. (See p. D-1.)

Sample collection quarter is noted in parentheses next to hydraulic position. Hydraulic position is relative to other wells within the same hydrogeologic unit.

TABLE D-6 *(continued)*
2007 Results for Metals in Groundwater
Title 6 NYCRR Appendix 33 List

Location Code	Hydraulic Position	Lead (µg/L)	Mercury (µg/L)	Nickel (µg/L)	Selenium (µg/L)	Silver (µg/L)	Thallium (µg/L)	Tin (µg/L)	Vanadium (µg/L)	Zinc (µg/L)
Sand and Gravel										
301	UP(3)	<3	<0.2	96	<5	<10	<10	<3,000	<50	<20
301	UP(4)	<3	<0.2	2,940	<5	<10	<10	<3,000	<50	<20
706	UP(1)	<3	<0.2	793	<5	<10	<10	<3,000	<50	<20
706	UP(2)	<3	<0.2	**583**	<5	<10	<10	<3,000	<50	<20
706	UP(3)	<3	<0.2	820	<5	<10	<10	<3,000	<50	<20
706	UP(4)	<3	<0.2	**994**	<25	<10	<10	<3,000	<50	<20
1304	UP(1)	<3	<0.2	<40	<5	<10	<10	<3,000	<50	<20
1304	UP(2)	<3	<0.2	<40	<5	<10	<10	<3,000	<50	<20
1304	UP(3)	<3	<0.2	<40	<5	<10	<10	<3,000	<50	<20
1304	UP(4)	<3	<0.2	<40	<5	<10	<10	<3,000	<50	<20
1302	DOWN(1)	<3	<0.2	<40	<5	<10	<10	<3,000	<50	<20
1302	DOWN(2)	<3	<0.2	<40	<5	<10	<10	<3,000	<50	<20
1302	DOWN(3)	<3	<0.2	<40	<5	<10	<10	<3,000	<50	<20
1302	DOWN(4)	<3	<0.2	<40	<5	<10	<10	<3,000	<50	<20
104	DOWN(3)	<3	NS	<40	<5	<10	<10	<3,000	<50	<20
104	DOWN(4)	<3	<0.2	<40	<5	<10	<10	<3,000	<50	<20
111	DOWN(1)	<2	<0.1	4	<4	<0.5	<6	<4	<1	5
408	DOWN(3)	<3	NR	137	<5	<10	<10	<3,000	<50	<20
408	DOWN(4)	<3	<0.2	165	<5	<10	<10	<3,000	<50	<20
501	DOWN(3)	<3	NR	<40	<5	<10	<10	<3,000	<50	<20
501	DOWN(4)	<3	<0.2	<40	<5	<10	<10	<3,000	<50	<20
502	DOWN(1)	<2	<0.1	**206**	<4	<0.5	NS	NS	**13**	**6**
502	DOWN(3)	<3	NR	**70**	<5	<10	<10	<3,000	<50	<20
502	DOWN(4)	<3	<0.2	130	<5	<10	<10	<3,000	<50	<20
8605	DOWN(1)	<2	<0.1	<2	<4	<0.5	<6	<4	<1	1
8609	DOWN(3)	<3	NR	<40	<5	<10	<10	<3,000	<50	<20
8609	DOWN(4)	<3	<0.2	<40	<5	<10	<10	<3,000	<50	<20
Weathered Till										
NDATR	DOWN(1)	<3	<0.2	<40	<5	<10	<10	<3,000	<50	<20
NDATR	DOWN(2)	<3	<0.2	<40	<5	<10	<10	<3,000	<50	<20
NDATR	DOWN(3)	<3	<0.2	<40	<5	<10	<10	<3,000	<50	<20
NDATR	DOWN(4)	<3	<0.2	<40	<5	<10	<10	<3,000	<50	**30**
909	DOWN(1)	4	<0.2	<40	<5	<10	<10	<3,000	<50	24

Note: Bolding convention applied to these data. (See p. D-1.)

NR - Mercury data not reported due to failure of analytical quality control.

NS - Not sampled.

Sample collection quarter is noted in parentheses next to hydraulic position. Hydraulic position is relative to other wells within the same hydrogeologic unit.

TABLE D-6 *(concluded)*
2007 Results for Metals in Groundwater
Title 6 NYCRR Appendix 33 List

Location Code	Hydraulic Position	Lead (µg/L)	Mercury (µg/L)	Nickel (µg/L)	Selenium (µg/L)	Silver (µg/L)	Thallium (µg/L)	Tin (µg/L)	Vanadium (µg/L)	Zinc (µg/L)
Unweathered Till										
405	UP(1)	<3	<0.2	950	<5	<10	<10	<3,000	<50	<20
405	UP(2)	<3	<0.2	1,160	<5	<10	<10	<3,000	<50	<20
405	UP(3)	<3	<0.2	**666**	<5	<10	<10	<3,000	<50	<20
405	UP(4)	<3	<0.2	**1,650**	<5	<10	<10	<3,000	<50	<20
1303	UP(1)	**15**	<0.2	**43**	<5	<10	<10	<3,000	<50	**85**
1303	UP(2)	22	<0.2	58	<5	<10	<10	<3,000	<50	113
1303	UP(3)	29	<0.2	**74**	<5	<10	<10	<3,000	**58**	**146**
1303	UP(4)	**31**	<0.2	51	<5	<10	<10	<3,000	<50	106

Note: Bolding convention applied to these data. (See p. D-1.)

Sample collection quarter is noted in parentheses next to hydraulic position. Hydraulic position is relative to other wells within the same hydrogeologic unit.

TABLE D-7
2007 Radioactivity in groundwater From Selected Monitoring Locations

Location Code	Hydraulic Position	C-14 (µCi/mL)	Sr-90 (µCi/mL)	Tc-99 (µCi/mL)
Sand and Gravel				
301	UP(3)	NS	8.50±8.98E-10	NS
401	UP(1)	-4.28±2.99E-08	0.84±1.13E-09	2.77±2.08E-09
706	UP(1)	-0.36±3.62E-08	2.68±1.15E-09	1.33±1.40E-09
706	UP(2)	-3.02±3.08E-08	**2.42±0.82E-09**	-1.20±2.82E-09
706	UP(3)	-0.98±3.93E-08	2.56±0.77E-09	-0.17±1.65E-09
706	UP(4)	-0.40±3.70E-08	**2.82±0.97E-09**	0.75±1.96E-09
1304	UP(1)	0.55±3.15E-08	1.15±1.07E-09	0.98±1.97E-09
1304	UP(2)	1.54±3.08E-08	**2.45±1.13E-09**	-1.25±2.60E-09
1304	UP(3)	0.21±3.96E-08	1.58±0.82E-09	-0.12±1.68E-09
1304	UP(4)	-1.17±3.82E-08	-5.02±7.67E-10	1.35±1.97E-09
1302	DOWN(1)	-0.33±3.11E-08	6.42±8.63E-10	1.69±2.03E-09
1302	DOWN(2)	**5.02±3.17E-08**	5.80±9.44E-10	-1.96±2.58E-09
1302	DOWN(3)	-0.98±3.94E-08	2.52±9.19E-10	-0.24±1.66E-09
1302	DOWN(4)	-0.16±3.68E-08	-0.50±6.69E-10	-0.28±1.89E-09
103	DOWN(4)	NS	1.06±0.09E-07	NS
111	DOWN(1)	NS	1.46±0.01E-06	NS
406	DOWN(1)	-0.40±3.61E-08	1.72±1.11E-09	1.90±1.40E-09
408	DOWN(1)	2.48±3.42E-08	15.10±0.01E-05	1.10±0.28E-08
501	DOWN(1)	NS	7.04±0.01E-05	NS
502	DOWN(1)	NS	8.61±0.01E-05	NS
8605	DOWN(1)	NS	4.96±0.01E-06	NS
8607	DOWN(3)	-1.46±3.92E-08	9.56±1.27E-09	8.91±2.17E-09
8607	DOWN(4)	-2.88±3.63E-08	7.52±1.38E-09	1.21±0.25E-08
8609	DOWN(1)	NS	9.01±0.04E-07	NS
8609	DOWN(3)	NS	1.06±0.01E-06	NS
116	DOWN(1)	NS	2.66±0.01E-06	NS
116	DOWN(3)	NS	3.86±0.02E-06	NS
801	DOWN(1)	NS	6.47±0.01E-06	NS
801	DOWN(2)	NS	7.18±0.04E-06	NS
801	DOWN(3)	NS	**5.70±0.03E-06**	NS
801	DOWN(4)	NS	**7.99±0.04E-06**	NS
8603	DOWN(1)	NS	4.09±0.01E-05	NS
8603	DOWN(3)	NS	3.62±0.01E-05	NS

Note: Bolding convention applied to these data. (See p. D-1.)

NS - Not sampled.

Sample collection quarter is noted in parentheses next to hydraulic position. Hydraulic position is relative to other wells within the same hydrogeologic unit.

TABLE D-7 *(continued)*
2007 Radioactivity in groundwater From Selected Monitoring Locations

Location Code	Hydraulic Position	C-14 (µCi/mL)	Sr-90 (µCi/mL)	Tc-99 (µCi/mL)
Weathered Till				
NDATR	DOWN(1)	3.12±3.68E-08	2.10±0.15E-07	2.35±1.45E-09
NDATR	DOWN(3)	-2.26±3.89E-08	1.08±0.04E-07	-1.58±2.11E-09
909	DOWN(1)	3.43±3.67E-08	1.41±0.05E-07	2.30±1.41E-09
Unweathered Till				
405	UP(1)	3.64±3.69E-08	0.53±1.12E-09	**3.98±2.66E-09**
405	UP(2)	-2.16±3.11E-08	1.88±0.88E-09	-4.08±2.73E-09
405	UP(3)	-4.21±3.85E-08	1.64±0.68E-09	-0.13±1.72E-09
405	UP(4)	1.79±3.73E-08	**2.60±1.07E-09**	1.07±1.96E-09
1303	UP(1)	-2.13±3.07E-08	6.69±8.77E-10	1.65±2.07E-09
1303	UP(2)	1.39±3.06E-08	-0.75±6.15E-10	-2.09±2.58E-09
1303	UP(3)	-3.18±3.87E-08	-2.51±4.29E-10	-0.88±1.59E-09
1303	UP(4)	-1.97±3.79E-08	3.83±6.32E-10	1.36±1.98E-09
910	DOWN(1)	-2.35±3.04E-08	1.78±0.25E-08	0.89±2.04E-09

Note: Bolding convention applied to these data. (See p. D-1.)

Sample collection quarter is noted in parentheses next to hydraulic position. Hydraulic position is relative to other wells within the same hydrogeologic unit.

TABLE D-7 *(continued)*
2007 Radioactivity in groundwater From Selected Monitoring Locations

Location Code	Hydraulic Position	I-129 (µCi/mL)	Cs-137 (µCi/mL)	Ra-226 (µCi/mL)	Ra-228 (µCi/mL)	U-232 (µCi/mL)
Sand and Gravel						
401	UP(1)	3.60±4.23E-10	0.96±1.95E-09	0.26±1.10E-10	9.80±4.13E-10	-3.99±3.96E-11
706	UP(1)	-0.92±5.06E-10	-1.74±1.94E-09	**5.06±3.00E-10**	1.13±4.58E-10	-0.34±4.17E-11
706	UP(2)	0.52±3.62E-10	-0.45±2.06E-09	3.92±1.63E-10	0.54±2.82E-10	-0.42±4.33E-11
706	UP(3)	-0.71±5.24E-10	0.76±1.94E-09	**2.24±2.07E-10**	6.29±3.59E-10	-1.69±1.73E-11
706	UP(4)	-2.05±4.34E-10	-0.26±1.95E-09	3.59±1.67E-10	**1.18±0.41E-09**	3.07±5.54E-11
1304	UP(1)	-0.24±3.47E-10	0.37±2.03E-09	**1.76±1.15E-10**	**6.88±4.19E-10**	-1.64±3.02E-11
1304	UP(2)	-3.42±7.11E-10	**2.52±2.51E-09**	3.26±2.50E-10	3.83±3.80E-10	-5.75±7.68E-11
1304	UP(3)	2.75±8.02E-10	1.46±1.99E-09	**2.18±0.40E-09**	**3.46±2.48E-10**	-4.15±2.77E-11
1304	UP(4)	-2.08±4.12E-10	0.30±2.15E-09	3.11±1.52E-10	6.58±4.54E-10	-1.93±3.58E-11
1302	DOWN(1)	**5.79±3.64E-10**	0.50±1.93E-09	4.21±1.83E-10	4.95±3.77E-10	5.56±7.60E-11
1302	DOWN(2)	1.13±5.49E-10	-0.31±2.02E-09	-0.26±1.37E-10	1.39±2.82E-10	-0.19±1.02E-10
1302	DOWN(3)	0.36±2.85E-10	0.81±1.79E-09	**5.86±2.49E-10**	3.07±2.91E-10	3.69±9.18E-11
1302	DOWN(4)	7.01±9.03E-10	2.82±3.33E-09	3.43±1.63E-10	**1.24±0.44E-09**	-2.02±3.39E-11
406	DOWN(1)	-0.37±4.85E-10	0.26±1.95E-09	1.58±2.30E-10	2.68±4.43E-10	0.10±4.47E-11
408	DOWN(1)	-0.32±1.13E-09	3.70±4.49E-09	1.06±0.41E-09	3.89±0.82E-09	-0.15±7.59E-11
8607	DOWN(3)	1.09±3.30E-10	0.45±1.83E-09	1.36±1.51E-10	6.71±3.43E-10	-1.48±7.22E-11
8607	DOWN(4)	2.74±4.81E-10	0.26±1.84E-09	0.67±1.06E-10	7.54±3.27E-10	2.60±6.63E-11
Weathered Till						
NDATR	DOWN(1)	0.00±4.79E-10	-1.66±1.90E-09	3.96±1.99E-10	-1.58±4.14E-10	-2.80±3.07E-11
NDATR	DOWN(3)	0.00±1.06E-09	-0.81±1.86E-09	1.64±1.56E-10	5.45±3.13E-10	-2.21±7.58E-11
909	DOWN(1)	5.63±1.49E-09	0.55±2.00E-09	3.75±2.73E-10	4.60±4.70E-10	-0.50±2.84E-11
Unweathered Till						
405	UP(1)	-3.76±3.71E-10	0.75±1.96E-09	1.28±1.32E-10	7.24±5.04E-10	-1.32±4.21E-11
405	UP(2)	3.78±3.20E-10	0.46±2.04E-09	**5.58±2.37E-10**	**7.11±3.79E-10**	2.53±6.14E-11
405	UP(3)	**5.92±3.92E-10**	-0.27±1.29E-09	3.37±2.34E-10	8.27±4.16E-10	5.14±6.71E-11
405	UP(4)	-0.04±1.76E-10	0.46±2.12E-09	5.42±1.99E-10	**1.49±0.40E-09**	1.65±4.16E-11
1303	UP(1)	-0.71±3.23E-10	-0.06±2.01E-09	1.98±1.44E-10	3.15±3.69E-10	-2.25±2.89E-11
1303	UP(2)	-5.45±9.28E-10	-0.40±2.04E-09	1.58±2.07E-10	-0.35±2.54E-10	0.87±1.21E-10
1303	UP(3)	**5.41±4.76E-10**	-0.25±1.89E-09	2.14±1.78E-10	0.58±2.56E-10	-4.44±3.86E-11
1303	UP(4)	-2.54±3.16E-10	1.53±2.12E-09	**3.50±1.71E-10**	1.96±2.87E-10	-0.13±3.86E-11
910	DOWN(1)	0.29±1.01E-09	1.54±1.94E-09	2.32±1.56E-10	4.30±3.95E-10	-4.82±4.77E-11
910	DOWN(4)	NS	1.10±2.03E-09	NS	NS	NS

Note: Bolding convention applied to these data. (See p. D-1.)
NS - Not sampled.
Sample collection quarter is noted in parentheses next to hydraulic position. Hydraulic position is relative to other wells within the same hydrogeologic unit.

TABLE D-7 *(concluded)*
2007 Radioactivity in groundwater From Selected Monitoring Locations

Location Code	Hydraulic Position	U-233/234 (µCi/mL)	U-235/236 (µCi/mL)	U-238 (µCi/mL)	Total U (µg/mL)
Sand and Gravel					
401	UP(1)	2.27±1.04E-10	2.76±3.79E-11	1.37±0.77E-10	2.86±0.08E-04
706	UP(1)	**8.08±6.00E-11**	3.54±4.32E-11	3.78±4.27E-11	**1.93±0.10E-04**
706	UP(2)	1.18±0.73E-10	1.43±3.24E-11	9.25±6.63E-11	9.39±0.47E-05
706	UP(3)	1.42±0.98E-10	0.47±3.54E-11	3.00±5.92E-11	0.00±5.67E-04
706	UP(4)	**1.81±0.86E-10**	3.52±4.91E-11	**1.05±0.63E-10**	0.00±6.78E-04
1304	UP(1)	**2.28±1.03E-10**	0.36±3.38E-11	1.92±0.93E-10	3.31±0.10E-04
1304	UP(2)	2.86±1.43E-10	1.38±3.67E-11	1.55±1.07E-10	**4.60±0.15E-04**
1304	UP(3)	2.29±1.20E-10	-1.52±3.43E-11	**1.19±0.94E-10**	3.80±0.12E-04
1304	UP(4)	**2.99±1.15E-10**	2.43±3.73E-11	**2.21±0.98E-10**	0.00±6.78E-04
1302	DOWN(1)	**8.79±7.90E-11**	2.51±4.96E-11	**9.46±7.85E-11**	-4.52±0.22E-05
1302	DOWN(2)	**3.18±1.73E-10**	1.73±4.58E-11	1.65±1.27E-10	1.39±0.05E-04
1302	DOWN(3)	1.97±1.14E-10	1.17±3.11E-11	1.00±0.80E-10	**1.82±0.09E-04**
1302	DOWN(4)	1.51±0.89E-10	**5.02±4.92E-11**	**1.76±0.96E-10**	0.00±6.78E-04
406	DOWN(1)	8.12±6.74E-11	3.02±4.14E-11	1.61±0.88E-10	1.07±0.36E-04
408	DOWN(1)	4.20±1.74E-10	1.19±1.05E-10	2.90±1.40E-10	7.78±0.22E-04
8607	DOWN(3)	5.64±7.69E-11	3.62±5.69E-11	1.47±5.37E-11	8.98±0.76E-05
8607	DOWN(4)	3.81±4.85E-11	3.36±4.24E-11	8.30±5.95E-11	0.00±6.78E-04
Weathered Till					
NDATR	DOWN(1)	3.39±1.29E-10	9.15±6.77E-11	4.01±1.40E-10	1.20±0.03E-03
NDATR	DOWN(3)	1.86±0.36E-09	8.43±8.27E-11	1.30±0.31E-09	4.52±0.12E-03
909	DOWN(1)	5.12±1.53E-10	1.21±0.77E-10	4.48±1.44E-10	1.11±0.05E-03
Unweathered Till					
405	UP(1)	4.72±1.46E-10	2.52±3.86E-11	**2.48±1.04E-10**	7.38±0.23E-04
405	UP(2)	**3.95±1.20E-10**	6.84±5.08E-11	2.68±0.98E-10	**5.64±0.18E-04**
405	UP(3)	4.66±1.76E-10	4.68±5.82E-11	**3.43±1.53E-10**	6.80±0.22E-04
405	UP(4)	**5.37±1.61E-10**	**1.41±0.83E-10**	2.86±1.17E-10	**1.08±0.03E-03**
1303	UP(1)	2.26±1.06E-10	-1.36±2.84E-11	2.43±1.05E-10	3.79±0.10E-04
1303	UP(2)	**4.16±2.01E-10**	2.35±4.60E-11	**1.99±1.38E-10**	4.49±0.12E-04
1303	UP(3)	3.77±1.51E-10	0.43±3.27E-11	2.58±1.29E-10	**4.93±0.17E-04**
1303	UP(4)	**2.14±0.96E-10**	3.58±4.04E-11	**2.92±1.07E-10**	0.00±6.78E-04
910	DOWN(1)	8.08±2.30E-10	2.55±4.78E-11	3.69±1.58E-10	1.01±0.02E-03

Note: Bolding convention applied to these data. (See p. D-1.)
Sample collection quarter is noted in parentheses next to hydraulic position. Hydraulic position is relative to other wells within the same hydrogeologic unit.

TABLE D-8
Practical Quantitation Limits (PQLs)

COMPOUND	PQL (µg/L)	COMPOUND	PQL (µg/L)
6 NYCRR[a] Appendix 33 Volatiles		6 NYCRR[a] Appendix 33 Volatiles	
Acetone	10	Isobutyl alcohol	100
Acetonitrile	100	Methacrylonitrile	5
Acrolein	11	Methyl ethyl ketone	10
Acrylonitrile	10	Methyl iodide	5
Allyl chloride	5	Methyl methacrylate	5
Benzene	5	4-Methyl-2-pentanone	10
Bromodichloromethane	5	Methylene bromide	10
Bromoform	5	Methylene chloride	5
Bromomethane	10	Pentachloroethane	5
Carbon disulfide	10	Propionitrile	50
Carbon tetrachloride	5	Styrene	5
Chlorobenzene	5	1,1,1,2-Tetrachloroethane	5
Chloroethane	10	1,1,2,2-Tetrachloroethane	5
Chloroform	5	Tetrachloroethylene	5
Chloromethane	10	Toluene	5
Chloroprene	5	1,1,1-Trichloroethane (1,1,1-TCA)	5
1,2-Dibromo-3-chloropropane	5	1,1,2-Trichloroethane	5
Dibromochloromethane	5	1,2,3-Trichloropropane	5
1,2-Dibromoethane	5	Vinyl acetate	10
Dichlorodifluoromethane (DCDFMeth)	5	Vinyl chloride	10
1,1-Dichloroethane (1,1-DCA)	5	Xylene (total)	5
1,2-Dichloroethane (1,2-DCA)	5	cis-1,3-Dichloropropene	5
1,1-Dichloroethylene (1,1-DCE)	5	trans-1,2-Dichloroethylene (1,2-DCE[trans])	5
1,2-Dichloropropane	5	trans-1,3-Dichloropropene	5
Ethyl benzene	5	trans-1,4-Dichloro-2-butene	5
Ethyl methacrylate	5	Trichloroethylene (TCE)	5
2-Hexanone	10	Trichlorofluoromethane	5
6 NYCRR[a] Appendix 33 Metals		6 NYCRR[a] Appendix 33 Metals	
Aluminum[b]	200	Lead	3
Antimony	10	Manganese[b]	15
Arsenic	10	Mercury	0.2
Barium	200	Nickel	40
Beryllium	1	Selenium	5
Cadmium	5	Silver	10
Chromium	10	Thallium	10
Cobalt	50	Tin	3,000

Note: Specific quantitation limits are highly matrix dependent and may not always be achievable.

[a] Title 6 of the Official Compilation of Codes, Rules, and Regulations of the State of New York.

[b] Not a 6 NYCRR Appendix 33 parameter; sampled for the north plateau early warning program.

TABLE D-8 *(continued)*
Practical Quantitation Limits (PQLs)

COMPOUND	PQL (µg/L)
6 NYCRR[a] Appendix 33 Semivolatiles	
Acenaphthene	10
Acenaphthylene	10
Acetophenone	10
2-Acetylaminofluorene	10
4-Aminobiphenyl	10
Aniline	10
Anthracene	10
Aramite	20
Benzo[a]anthracene	10
Benzo[a]pyrene	10
Benzo[b]fluoranthene	10
Benzo[ghi]perylene	10
Benzo[k]fluoranthene	10
Benzyl alcohol	10
Bis(2-chlorethyl)ether	10
Bis(2-chloroethoxy)methane	10
Bis(2-chloroisopropyl)ether	10
Bis(2-ethylhexyl)phthalate	10
4-Bromophenyl phenyl ether	10
Butyl benzyl phthalate	10
Chlorobenzilate	10
2-Chloronaphthalene	10
2-Chlorophenol	10
4-Chlorophenyl phenyl ether	10
Chrysene	10
Di-n-butyl phthalate	10
Di-n-octyl phthalate	10
Diallate	10
Dibenz[a,h]anthracene	10
Dibenzofuran	10
3,3-Dichlorobenzidine	10
2,4-Dichlorophenol	10
2,6-Dichlorophenol	10
Diethyl phthalate	10
Dimethoate	10
7, 12-Dimethylbenz[a]anthracene	10
3,3-Dimethylbenzidine	20
2,4-Dimethylphenol	10
Dimethyl phthalate	10
4,6-Dinitro-o-cresol	25
2,4-Dinitrophenol	25

COMPOUND	PQL (µg/L)
6 NYCRR[a] Appendix 33 Semivolatiles	
2,4-Dinitrotoluene	10
2,6-Dinitrotoluene	10
Diphenylamine	10
Ethyl methanesulfonate	10
Famphur	15
Fluoranthene	10
Fluorene	10
Hexachlorobenzene	10
Hexachlorobutadiene	10
Hexachlorocyclopentadiene	24
Hexachloroethane	10
Hexachlorophene	250
Hexachloropropene	10
Indeno(1,2,3,-cd)pyrene	10
Isodrin	10
Isophorone	10
Isosafrole	10
Kepone	50
Methapyrilene	40
Methyl methanesulfonate	10
3-Methylcholanthrene	10
2-Methylnaphthalene	10
1,4-Naphthoquinone	10
1-Naphthylamine	10
2-Naphthylamine	10
Nitrobenzene	10
5-Nitro-o-toluidine	10
4-Nitroquinoline 1-oxide	40
N-Nitrosodi-n-butylamine	10
N-Nitrosodiethylamine	10
N-Nitrosodimethylamine	10
N-Nitrosodipropylamine	10
N-Nitrosodiphenylamine	10
N-Nitrosomethylethylamine	10
N-Nitrosomorpholine	10
N-Nitrosopiperidine	50
N-Nitrosopyrrolidine	10
Naphthalene	10
0,0,0-Triethyl phosphorothioate	10
0,0-Diethyl 0-2-pyrazinyl- phosphorothioate	10

Note: Specific quantitation limits are highly matrix dependent and may not always be achievable.
[a] Title 6 of the Official Compilation of Codes, Rules, and Regulations of the State of New York.

TABLE D-8 *(concluded)*
Practical Quantitation Limits (PQLs)

COMPOUND	PQL (µg/L)
6 NYCRR[a] Appendix 33 Semivolatiles	
p-(Dimethylamino)azobenzene	10
p-Chloroaniline	10
p-Chloro-m-cresol	10
p-Cresol	10
p-Dichlorobenzene	10
p-Nitroaniline	25
p-Nitrophenol	25
p-Phenylenediamine	35
Parathion	10
Pentachlorobenzene	10
Pentachloronitrobenzene	50
Pentachlorophenol	25
Phenacetin	10
Phenanthrene	10
Phenol	10
Pronamide	10
Pyrene	10
Safrole	10
1,2,4,5-Tetrachlorobenzene	10
Other Organic Compounds	
1,2-Dichloroethelyne (Total)	5
Tributyl phosphate	10

COMPOUND	PQL (µg/L)
6 NYCRR[a] Appendix 33 Semivolatiles	
2,3,4,6-Tetrachlorophenol	10
Tetraethyl dithiopyrophosphate	10
1,2,4-Trichlorobenzene	10
2,4,5-Trichlorophenol	25
2,4,6-Trichlorophenol	10
alpha,alpha-Dimethylphenethylamine	50
m-Cresol	10
m-Dichlorobenzene	10
m-Dinitrobenzene	10
m-Nitroaniline	25
o-Cresol	10
o-Dichlorobenzene	10
o-Nitroaniline	25
o-Nitrophenol	10
o-Toluidine	10
sym-Trinitrobenzene	10
2-Picoline	10
Pyridine	10
1,4-Dioxane	10

Note: Specific quantitation limits are highly matrix dependent and may not always be achievable.
[a] Title 6 of the Official Compilation of Codes, Rules, and Regulations of the State of New York.

APPENDIX E

Summary of Biological Data

The following tables contain a bolding convention devised to help the reader, when viewing the data, to quickly see the range of detectable measurements within a data series. A data series is a set of chemical or radionuclide measurements (e.g., gross alpha, gross beta, tritium) from a single location or from similar locations. Note that some tables contain data that should not be technically evaluated under this convention.

Key to bolding convention:

Results for each constituent constitute a single data series. If a radiological result is larger than the uncertainty term, the measurement is considered positive. Otherwise, a result is considered nondetectable.

If all results in a data series are positive, the lowest and highest values are bolded.
If a data series contains some positive results, the highest value is bolded.
If all values in a data series are nondetectable, no values are bolded.

TABLE E-1
2007 Radioactivity Concentrations in Milk

Location	K-40 (µCi/mL)	Sr-90 (µCi/mL)	I-129 (µCi/mL)	Cs-137 (µCi/mL)
BFMBLSY (WNW Farm)				
Annual	1.50±0.18E-06	5.03±5.42E-10	-0.63±1.70E-10	1.89±3.37E-09
BFMCTLS (Control)				
Annual	1.42±0.17E-06	5.54±7.49E-10	-4.94±3.46E-10	-2.74±4.51E-09
BFMSCHT (S Farm)				
Annual	1.14±0.15E-06	1.49±0.98E-09	-0.50±2.19E-10	3.61±3.93E-09
BFMWIDR (SE Farm)				
1st Quarter	1.51±0.21E-06	1.15±0.94E-09	-1.81±2.56E-10	-1.12±6.30E-09
2nd Quarter	**1.39±0.15E-06**	-5.51±5.74E-10	0.79±1.36E-10	2.30±2.67E-09
3rd Quarter	**1.54±0.24E-06**	**7.11±5.79E-10**	-0.90±1.48E-10	-4.09±5.94E-09
4th Quarter	1.51±0.18E-06	**1.34±1.15E-09**	-0.45±1.74E-10	-3.97±3.89E-09

Note: Bolding convention applied to these data.

TABLE E-2
2007 Radioactivity Concentrations in Venison

Location	% Moisture	H-3 (µCi/mL)	K-40 (µCi/g - dry)	Sr-90 (µCi/g - dry)	Cs-137 (µCi/g - dry)
Deer Background (BFDCTRL 11/07)	72.1	**1.20±1.05E-07**	**9.20±0.93E-06**	0.72±1.37E-09	2.21±2.18E-08
Deer Background (BFDCTRL 11/07)	73.8	-2.04±9.34E-08	**1.13±0.11E-05**	**2.44±1.61E-09**	**8.20±2.49E-08**
Deer Background (BFDCTRL 11/07)	73.7	3.49±9.66E-08	1.02±0.12E-05	-0.50±1.61E-09	2.91±3.17E-08
Deer Near-Site (BFDNEAR 10/07)	74.9	**1.25±1.06E-07**	**1.29±0.13E-05**	0.69±2.23E-09	3.52±2.75E-08
Deer Near-Site (BFDNEAR 10/07)	73.4	**1.69±1.12E-07**	**1.05±1.23E-06**	1.06±2.47E-09	**1.05±0.11E-06**
Deer Near-Site (BFDNEAR 12/07)	75.1	1.32±1.04E-07	1.19±0.10E-05	**4.27±2.19E-09**	1.48±1.60E-08

Note: Bolding convention applied to these data. See page E-1.

TABLE E-3
2007 Radioactivity Concentrations in Food Crops

Location	% Moisture	H-3 (µCi/mL)	K-40 (µCi/g - dry)	Co-60 (µCi/g - dry)	Sr-90 (µCi/g - dry)	Cs-137 (µCi/g - dry)
APPLES						
Background						
(BFVCTRA)	86.5	6.90±9.65E-08	9.20±0.98E-06	1.76±2.85E-08	2.21±0.36E-08	-0.53±2.07E-08
Near-Site						
(BFVNEAAF)	85.8	-0.34±1.05E-07	6.68±1.23E-06	-0.65±3.57E-08	-0.67±2.26E-09	0.72±2.97E-08
BEANS						
Background						
(BFVCTRB)	92.2	-0.70±1.00E-07	2.39±0.21E-05	5.27±4.07E-08	4.67±0.67E-08	-2.73±5.36E-08
Near-Site						
(BFVNEAB)	86.2	0.58±1.06E-07	2.22±0.19E-05	-0.23±2.21E-08	5.89±0.58E-08	1.68±2.01E-08
CORN						
Background						
(BFVCTRC)	75.0	-0.26±1.06E-07	1.05±0.10E-05	-0.81±1.44E-08	1.14±1.77E-09	0.62±1.29E-08
Near-Site						
(BFVNEAC)	79.6	1.37±1.09E-07	1.32±0.10E-05	0.40±1.55E-08	1.82±2.03E-09	0.70±1.66E-08

Note: Bolding convention not applicable to these data. See page E-1.

TABLE E-4
2007 Radioactivity Concentrations in Edible Portions of Fish From Cattaraugus Creek

Cattaraugus Creek above the Springville Dam (BFFCATC)

Species	% Moisture	Sr-90 (µCi/g - dry)	Cs-137 (µCi/g - dry)
		Annual 2007	
Hog-nosed Sucker	82.2	-1.11±3.66E-09	1.59±4.76E-08
Hog-nosed Sucker	81.6	-0.12±4.86E-09	-1.30±7.35E-08
Hog-nosed Sucker	81.6	-6.97±5.05E-09	-0.75±3.09E-08
Hog-nosed Sucker	83.0	-2.15±4.94E-09	**1.06±0.97E-07**
Hog-nosed Sucker	82.0	-4.85±6.57E-09	-5.14±4.73E-08
Hog-nosed Sucker	81.1	-7.68±6.02E-09	3.98±5.24E-08
White Sucker	81.7	**7.58±7.10E-09**	3.06±4.00E-08
White Sucker	82.3	5.87±7.47E-09	0.85±1.49E-07
Brown Trout	78.0	1.94±2.63E-09	0.00±5.72E-08
Brown Trout	79.3	6.37±9.22E-09	0.79±6.08E-08
Average % Moisture	81.3		
Median		<5.54E-09	<5.48E-08
Maximum		7.58E-09	1.06E-07
Minimum		<2.63E-09	<3.09E-08

Note: Bolding convention applied to these data. See page E-1.

TABLE E-4 *(continued)*
2007 Radioactivity Concentrations in Edible Portions of Fish From Cattaraugus Creek

Cattaraugus Creek below the Springville Dam (BFFCATD)

Annual 2007

Species	% Moisture	Sr-90 (µCi/g - dry)	Cs-137 (µCi/g - dry)
Steelhead Trout	85.3	1.86±2.74E-09	2.74±2.92E-08
Steelhead Trout	73.8	0.24±1.84E-09	-0.36±2.96E-08
Steelhead Trout	70.0	1.60±2.31E-09	0.97±2.87E-08
Steelhead Trout	75.0	-0.19±2.78E-09	1.04±1.42E-08
Steelhead Trout	74.4	1.06±2.40E-09	2.75±3.43E-08
Steelhead Trout	66.8	0.86±2.12E-09	2.19±2.49E-08
Steelhead Trout	74.9	-0.59±2.49E-09	1.47±2.08E-08
Steelhead Trout	77.9	3.67±2.95E-09	0.50±4.19E-08
Steelhead Trout	74.5	**6.34±3.06E-09**	0.00±2.64E-08
Steelhead Trout	70.8	-0.67±2.55E-09	2.27±3.41E-08
Average % Moisture	74.3		
Median		<2.52E-09	<2.90E-08
Maximum		6.34E-09	<4.19E-08
Minimum		<1.84E-09	<1.42E-08

Note: Bolding convention applied to these data. See page E-1.

TABLE E-4 *(concluded)*
2007 Radioactivity Concentrations in Edible Portions of Fish From Cattaraugus Creek

Cattaraugus Creek Background (BFFCTRL)

Annual 2007

Species	% Moisture	Sr-90 (µCi/g - dry)	Cs-137 (µCi/g - dry)
White Sucker	80.2	-5.53±6.36E-09	1.93±7.82E-08
Brown Trout	76.0	2.04±6.77E-09	0.00±1.36E-07
Brown Trout	86.4	-1.81±1.80E-09	**4.93±3.10E-08**
White Sucker	80.8	0.63±1.96E-09	2.33±3.53E-08
White Sucker	80.0	2.17±2.29E-09	0.26±2.22E-08
White Sucker	78.4	3.24±2.78E-09	-1.93±3.44E-08
White Sucker	78.5	**3.72±2.78E-09**	1.00±3.48E-08
White Sucker	78.1	3.12±2.66E-09	-0.12±4.29E-08
Hog-nosed Sucker	77.9	-0.51±2.19E-09	-5.35±8.85E-08
White Sucker	79.5	2.14±3.29E-09	-2.29±4.83E-08
Average % Moisture	79.6		
Median		<3.18E-09	<4.56E-08
Maximum		3.72E-09	4.93E-08
Minimum		<1.80E-09	<2.22E-08

Note: Bolding convention applied to these data. See page E-1.

APPENDIX F-1

Summary of Soil and Aquatic Sediment Guidelines and Standards

TABLE F-1A
Soils Cleanup Objectives and Cleanup Levels[a]

Analyte	*Units*	*TAGM #4046 Eastern U.S. Background Concentrations for Soil[a]*	*6 NYCRR Subpart 375-6.8(a)[b] Remedial Soil Cleanup Objectives*
Aluminum	mg/kg (ppm)	33,000	--
Antimony	mg/kg (ppm)	--	--
Arsenic	mg/kg (ppm)	3–12[c]	13
Barium	mg/kg (ppm)	15–600	350
Beryllium	mg/kg (ppm)	0–1.75	7.2
Cadmium	mg/kg (ppm)	0.1–1	2.5
Calcium	mg/kg (ppm)	130–35,000	--
Chromium	mg/kg (ppm)	1.5–40[c]	30
Cobalt	mg/kg (ppm)	2.5–60[c]	--
Copper	mg/kg (ppm)	1–50	50
Iron	mg/kg (ppm)	2,000–550,000	--
Lead	mg/kg (ppm)	4–61[d]	63
Magnesium	mg/kg (ppm)	100–5,000	--
Manganese	mg/kg (ppm)	50–5,000	1,600
Mercury	mg/kg (ppm)	0.001–0.2	0.18
Nickel	mg/kg (ppm)	0.5–25	30
Potassium	mg/kg (ppm)	8,500–43,000[c]	--
Selenium	mg/kg (ppm)	0.1–3.9	3.9
Silver	mg/kg (ppm)	--	2
Sodium	mg/kg (ppm)	6,000–8,000	--
Thallium	mg/kg (ppm)	--	--
Vanadium	mg/kg (ppm)	1–300	--
Zinc	mg/kg (ppm)	9–50	109

-- No reference level available for these analytes

[a] Source: New York State Department of Environmental Conservation "Technical and Administrative Guidance Memorandum (TAGM) #4046"

[b] Source: 6 NYCRR Subpart 375-6.8(a) Remedial Soil Cleanup Objectives: Unrestricted Use Soil Cleanup Objectives

[c] New York State background

[d] Background levels for lead vary widely. Average levels in undeveloped, rural areas may range from 4–61 ppm. Average background levels in metropolitan or suburban areas or near highways are much higher and typically range from 200–500 ppm.

TABLE F-1B
Screening Concentrations for Contaminated Sediment[a]

Analyte	*Units*	*Lowest Effect Level* [b]	*Severe Effect Level* [c]
Aluminum	mg/kg (ppm)	--	--
Antimony	mg/kg (ppm)	2.0 (L)	25.0 (L)
Arsenic	mg/kg (ppm)	6.0 (P)	33.0 (P)
Barium	mg/kg (ppm)	--	--
Beryllium	mg/kg (ppm)	--	--
Cadmium	mg/kg (ppm)	0.6 (P)	9.0 (L)
Calcium	mg/kg (ppm)	--	--
Chromium	mg/kg (ppm)	26.0 (P)	110.0 (P)
Cobalt	mg/kg (ppm)	--	--
Copper	mg/kg (ppm)	16.0 (P)	110.0 (P)
Iron	%	2.0 (P)	4.0 (P)
Lead	mg/kg (ppm)	31.0 (P)	110.0 (L)
Magnesium	mg/kg (ppm)	--	--
Manganese	mg/kg (ppm)	460.0 (P)	1,100.0 (L)
Mercury	mg/kg (ppm)	0.15 (L)	1.3 (L)
Nickel	mg/kg (ppm)	16.0 (P)	50.0 (L)
Potassium	mg/kg (ppm)	--	--
Selenium	mg/kg (ppm)	--	--
Silver	mg/kg (ppm)	1.0 (L)	2.2 (L)
Sodium	mg/kg (ppm)	--	--
Thallium	mg/kg (ppm)	--	--
Vanadium	mg/kg (ppm)	--	--
Zinc	mg/kg (ppm)	120.0 (P/L)	270.0 (L)

L - An "L" following a criterion indicates that it was taken from Long and Morgan (1990).
P - A "P" following a criterion indicates that it was taken from Persaud et al. (1992).
-- No reference value available for these analytes

[a] Source: New York State Department of Environmental Conservation "Technical Guidance for Screening Contaminated Sediments," January 1999

[b] The Lowest Effect Level for each metal is the lowest of the either the Persaud et al. (1992) Lowest Effect Level or the Long and Morgan (1990) Effect Range-Low

[c] The Severe Effect Level for each metal is the lowest of either the Persaud et al. (1992) Severe Effect Level or the Long and Morgan (1990) Effect Range-Moderate

TABLE F-1C
Screening Thresholds for In-Water and Riparian Management of Sediment and Dredge Material[a]

Analyte	*Units*	*No Appreciable Contamination Level*
Arsenic	mg/kg (ppm)	<14
Cadmium	mg/kg (ppm)	<1.2
Copper	mg/kg (ppm)	<33
Lead	mg/kg (ppm)	<33
Mercury	mg/kg (ppm)	<0.17

[a] Source: Draft New York State Department of Environmental Conservation Technical and Operational Guidance Series (TOGS) #5.1.9, "In-Water and Riparian Management of Sediment and Dredge Material"

TABLE F-1D
Radionuclide Comparison Values for Soils

Radionuclide	*Units*	*Consultation Triggers for Soil Contamination* [a]		*NUREG-1757 Screening Values of Common Radionuclides for Soil Surface Contamination Levels* [b]
		Residential Soil Concentration	*Industrial/Commercial Concentration*	
Co-60	µCi/g	4E-06	6E-06	3.8E-06
Sr-90	µCi/g	--	--	1.7E-06
Sr-90+D[c]	µCi/g	2.3E-05	1.07E-03	--
Cs-137	µCi/g	--	--	1.1E-05
Cs-137+D[c]	µCi/g	6E-06	1.1E-05	--
U-234	µCi/g	4.01E-04	3.31E-03	1.3E-05
U-235	µCi/g	--	--	8E-06
U-235+D[c]	µCi/g	2.0E-05	3.9E-05	2.9E-07
U-238	µCi/g	--	--	1.4E-05
U-238+D[c]	µCi/g	7.4E-05	1.79E-04	5E-07
Total U	µg/g	4.7E+01	1.23E+03	--
Pu-238	µCi/g	2.97E-04	1.64E-03	2.5E-06
Pu-239	µCi/g	2.59E-04	1.43E-03	2.3E-06
Am-241	µCi/g	1.87E-04	5.68E-04	2.1E-06

-- No reference trigger available

[a] Memorandum of Understanding between the Environmental Protection Agency and the Nuclear Regulatory Commission "Consultation and Finality on Decommissioning and Decontamination of Contaminated Sites," September 2002.

[b] U.S. Nuclear Regulatory Commission. Consolidated Decommissioning Guidance: Characterization, Survey, and Determination of Radiological Criteria. NUREG-1757, Vol. 2, Rev. 1. September 2006.

[c] Concentrations apply to the parent radionuclide but assume that the daughter products are present in equilibrium.

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APPENDIX F-2

Soil and Sediment Data

TABLE F-2A
2007 Contaminants in On-Site Soils Downstream of the WVDP at Franks Creek (SNSP006)

RADIOACTIVE CONSTITUENTS

Isotope	*Units*	*N*	*SNSP006*	*Consultation Triggers [a] For Soil Contamination*		*NUREG-1757 Soil Screening Contamination Levels [b]*
				Residential	*Industrial Commercial*	
Gross Alpha	µCi/g	1	7.38±1.59E-06	--	--	--
Gross Beta	µCi/g	1	2.36±0.19E-05	--	--	--
K-40	µCi/g	1	1.56±0.13E-05	--	--	--
Co-60	µCi/g	1	1.05±2.16E-08	4E-06	6E-06	3.8E-06
Sr-90	µCi/g	1	4.90±0.95E-07	2.3E-05[c]	1.07E-03[c]	1.7E-06
Cs-137	µCi/g	1	5.00±0.41E-06	6E-06[c]	1.1E-05[c]	1.1E-05
U-232	µCi/g	1	1.92±3.32E-08	--	--	--
U-233/234	µCi/g	1	6.28±1.37E-07	4.01E-04	3.31E-03	1.3E-05
U-235/236	µCi/g	1	4.72±4.20E-08	2.0E-05[c]	3.9E-05[c]	8.0E-06[d]
U-238	µCi/g	1	5.84±1.33E-07	7.4E-05[c]	1.79E-04[c]	1.4E-05[d]
Total U	µg/g	1	2.24±0.07E+00	4.7E+01	1.23E+03	--
Pu-238	µCi/g	1	1.79±2.25E-08	2.97E-04	1.64E-03	2.5E-06
Pu-239/240	µCi/g	1	3.41±2.34E-08	2.59E-04	1.43E-03	2.3E-06
Am-241	µCi/g	1	4.34±3.78E-08	1.87E-04	5.68E-04	2.1E-06

N - Number of samples
-- No reference trigger available
[a] Memorandum of Understanding between the EPA and the NRC "Consultation and Finality on Decommissioning and Decontamination of Contaminated Sites."
[b] U.S. Nuclear Regulatory Commission. "Consolidated Decommissioning Guidance: Characterization, Survey, and Determination of Radiological Criteria." NUREG-1757, Vol. 2, Rev. 1. September 2006.
[c] Concentrations apply to the parent radionuclide but assume that the daughter products are present in equilibrium.
[d] WVDP-related uranium isotopes are not assumed to be in equilibrium with daughter products because of their relatively recent origin as processed nuclear materials. Therefore, the single-nuclide screening levels for U-235 and U-238 were selected for comparison with radionuclide concentrations in on-site soils.

TABLE F-2A *(concluded)*
2007 Contaminants in On-Site Soils Downstream of the WVDP at Franks Creek (SNSP006)

METALS

Analyte	*Units*	*N*	*SNSP006*	*Guidance Values* Lowest Effect Level [a]	Severe Effect Level [a]	No Appreciable Contamination Level [b]
Aluminum	mg/kg (ppm)	1	6,550	--	--	--
Antimony	mg/kg (ppm)	1	<6.00	2.0	25.0	--
Arsenic	mg/kg (ppm)	1	8.8	6.0	33.0	14
Barium	mg/kg (ppm)	1	53	--	--	--
Beryllium	mg/kg (ppm)	1	<0.50	--	--	--
Cadmium	mg/kg (ppm)	1	<0.50	0.6	9.0	<1.2
Calcium	mg/kg (ppm)	1	13,900	--	--	--
Chromium	mg/kg (ppm)	1	9.2	26.0	110.0	--
Cobalt	mg/kg (ppm)	1	10	--	--	--
Copper	mg/kg (ppm)	1	13.8	16.0	110.0	<33
Iron	%	1	1.7	2.0	4.0	--
Lead	mg/kg (ppm)	1	11.8	31.0	110.0	<33
Magnesium	mg/kg (ppm)	1	5,620	--	--	--
Manganese	mg/kg (ppm)	1	629	460.0	1,100.0	--
Mercury	mg/kg (ppm)	1	<0.02	0.15	1.3	0.17
Nickel	mg/kg (ppm)	1	17.4	16.0	50.0	--
Potassium	mg/kg (ppm)	1	758	--	--	--
Selenium	mg/kg (ppm)	1	4.05	--	--	--
Silver	mg/kg (ppm)	1	2.3	1.0	2.2	--
Sodium	mg/kg (ppm)	1	<500	--	--	--
Thallium	mg/kg (ppm)	1	1.3	--	--	--
Vanadium	mg/kg (ppm)	1	14.5	--	--	--
Zinc	mg/kg (ppm)	1	67.6	120.0	270.0	--

N - Number of samples
-- No reference standard available
[a] Screening guidelines for chemical constituents obtained from NYSDEC "Technical Guidance for Screening Contaminated Sediments"
[b] NYSDEC: Draft Technical & Operational Guidance Series 5.1.9, "In-Water and Riparian Management of Sediment and Dredge Material," January 2003.

TABLE F-2B
2007 Contaminants in On-Site Soils From North Swamp (SNSW74A)

RADIOACTIVE CONSTITUENTS

Isotope	*Units*	*N*	*SNSW74A*	*Consultation Triggers*[a] *For Soil Contamination*		*NUREG-1757 Soil Screeening Contamination Levels*[b]
				Residential	*Industrial/ Commercial*	
Gross Alpha	µCi/g	1	1.33±0.19E-05	--	--	--
Gross Beta	µCi/g	1	2.04±0.17E-05	--	--	--
K-40	µCi/g	1	1.41±0.12E-05	--	--	--
Co-60	µCi/g	1	1.11±2.48E-08	4E-06	6E-06	3.8E-06
Sr-90	µCi/g	1	1.96±0.67E-07	2.3E-05[c]	1.07E-03[c]	1.7E-06
Cs-137	µCi/g	1	2.57±0.23E-06	6E-06[c]	1.1E-05[c]	1.1E-05
U-232	µCi/g	1	1.40±3.45E-08	--	--	--
U-233/234	µCi/g	1	8.71±1.58E-07	4.01E-04	3.31E-03	1.3E-05
U-235/236	µCi/g	1	1.01±0.54E-07	2.0E-05[c]	3.9E-05[c]	8E-06[d]
U-238	µCi/g	1	8.06±1.52E-07	7.4E-05[c]	1.79E-04[c]	1.4E-05[d]
Total U	µg/g	1	2.43±0.08E+00	4.7E+01	1.23E+03	--
Pu-238	µCi/g	1	1.14±2.07E-08	2.97E-04	1.64E-03	2.5E-06
Pu-239/240	µCi/g	1	7.31±3.29E-08	2.59E-04	1.43E-03	2.3E-06
Am-241	µCi/g	1	4.04±3.63E-08	1.87E-04	5.68E-04	2.1E-06

N - Number of samples
-- No reference trigger available
[a] Memorandum of Understanding between the EPA and the NRC "Consultation and Finality on Decommissioning and Decontamination of Contaminated Sites."
[b] U.S. Nuclear Regulatory Commission. "Consolidated Decommissioning Guidance: Characterization, Survey, and Determination of Radiological Criteria." NUREG-1757, Vol. 2, Rev. 1. September 2006.
[c] Concentrations apply to the parent radionuclide but assume that the daughter products are in equilibrium.
[d] WVDP-related uranium isotopes are not assumed to be in equilibrium with daughter products because of their relatively recent origin as processed nuclear materials. Therefore, the single-nuclide screening levels for U-235 and U-238 were selected for comparison with radionuclide concentrations in on-site soils.

TABLE F-2B *(concluded)*
2007 Contaminants in On-Site Soils From North Swamp (SNSW74A)

METALS

Analyte	*Units*	*N*	*SNSW74A*	*TAGM #4046 Recommended Soil Cleanup Objective* [a]	*6 NYCRR Subpart 375-6.8(a) Remedial Program Soil Cleanup Objective* [b]
Aluminum	mg/kg (ppm)	1	6,330	33,000	--
Antimony	mg/kg (ppm)	1	<6.00	--	--
Arsenic	mg/kg (ppm)	1	8.4	3–12[c]	13
Barium	mg/kg (ppm)	1	45.1	15–600	350
Beryllium	mg/kg (ppm)	1	<0.50	0–1.75	7.2
Cadmium	mg/kg (ppm)	1	<0.50	0.1–1	2.5
Calcium	mg/kg (ppm)	1	39,000	130–35,000	--
Chromium	mg/kg (ppm)	1	9.6	1.5–40[c]	30
Cobalt	mg/kg (ppm)	1	5.3	2.5–60[c]	--
Copper	mg/kg (ppm)	1	21.8	1–50	50
Iron	mg/kg (ppm)	1	17,400	2,000–550,000	--
Lead	mg/kg (ppm)	1	13.8	4–61[d]	63
Magnesium	mg/kg (ppm)	1	7,320	100–5,000	--
Manganese	mg/kg (ppm)	1	496	50–5,000	1,600
Mercury	mg/kg (ppm)	1	0.02	0.001–0.2	0.18
Nickel	mg/kg (ppm)	1	13.7	0.5–25	30
Potassium	mg/kg (ppm)	1	648	8,500–43,000[c]	--
Selenium	mg/kg (ppm)	1	8.9	0.1–3.9	3.9
Silver	mg/kg (ppm)	1	<1.00	--	2
Sodium	mg/kg (ppm)	1	<500	6,000–8,000	--
Thallium	mg/kg (ppm)	1	<1.00	--	--
Vanadium	mg/kg (ppm)	1	10.4	1–300	--
Zinc	mg/kg (ppm)	1	146	9–50	109

N - Number of samples
-- No reference standard available
[a] NYSDEC: Technical and Administrative Guidance Memorandum (TAGM) #4046.
[b] 6 NYCRR Subpart 375-6.8(a) Remedial Program Soil Cleanup Objectives
[c] New York State background
[d] Background levels for lead vary widely. Average levels in undeveloped rural areas may range from 4–61 ppm (reported here). Average background levels in metropolitain or suburban areas, or near highways are much higher and typically range from 200–500 ppm.

TABLE F-2C
2007 Contaminants in On-Site Soils From Northeast Swamp (SNSWAMP)

RADIOACTIVE CONSTITUENTS

Isotope	*Units*	*N*	*SNSWAMP*	*Consultation Triggers [a] For Soil Contamination*		*NUREG-1757 Soil Screening Contamination Levels [b]*
				Residential	*Industrial/ Commercial*	
Gross Alpha	µCi/g	1	2.02±0.27E-05	--	--	--
Gross Beta	µCi/g	1	6.45±0.28E-05	--	--	--
K-40	µCi/g	1	1.96±0.17E-05	--	--	--
Co-60	µCi/g	1	-0.52±2.69E-08	4E-06	6E-06	3.8E-06
Sr-90	µCi/g	1	1.71±0.06E-05	2.3E-05[c]	1.07E-03[c]	1.7E-06
Cs-137	µCi/g	1	1.66±0.13E-05	6E-06[c]	1.1E-05[c]	1.1E-05
U-232	µCi/g	1	4.79±4.23E-08	--	--	--
U-233/234	µCi/g	1	8.76±1.60E-07	4.01E-04	3.31E-03	1.3E-05
U-235/236	µCi/g	1	1.02±0.56E-07	2.0E-05[c]	3.9E-05[c]	8E-06[d]
U-238	µCi/g	1	9.07±1.63E-07	7.4E-05[c]	1.79E-04[c]	1.4E-05[d]
Total U	µg/g	1	2.55±0.09E+00	4.7E+01	1.23E+03	--
Pu-238	µCi/g	1	2.94±0.88E-07	2.97E-04	1.64E-03	2.5E-06
Pu-239/240	µCi/g	1	4.99±1.15E-07	2.59E-04	1.43E-03	2.3E-06
Am-241	µCi/g	1	9.80±1.69E-07	1.87E-04	5.68E-04	2.1E-06

N - Number of samples
-- No reference trigger available
[a] Memorandum of Understanding between the EPA and the NRC "Consultation and Finality on Decommissioning and Decontamination of Contaminated Sites."
[b] U.S. Nuclear Regulatory Commission. "Consolidated Decommissioning Guidance: Characterization, Survey, and Determination of Radiological Criteria." NUREG-1757, Vol. 2, Rev. 1. September 2006.
[c] Concentrations apply to the parent radionuclide but assume that the daughter products are in equilibrium.
[d] WVDP-related uranium isotopes are not assumed to be in equilibrium with daughter products because of their relatively recent origin as processed nuclear materials. Therefore, the single-nuclide screening levels for U-235 and U-238 were selected for comparison with radionuclide concentrations in on-site soils.

TABLE F-2C *(concluded)*
2007 Contaminants in On-Site Soils From Northeast Swamp (SNSWAMP)

METALS

Analyte	*Units*	*N*	*SNSWAMP*	*TAGM #4046 Recommended Soil Cleanup Objective* [a]	*6 NYCRR Subpart 375-6.8(a) Remedial Program Soil Cleanup Objectives* [b]
Aluminum	mg/kg (ppm)	1	11,400	33,000	--
Antimony	mg/kg (ppm)	1	<6.00	--	--
Arsenic	mg/kg (ppm)	1	15.3	3–12[c]	13
Barium	mg/kg (ppm)	1	101	15–600	350
Beryllium	mg/kg (ppm)	1	0.65	0–1.75	7.2
Cadmium	mg/kg (ppm)	1	0.64	0.1–1	2.5
Calcium	mg/kg (ppm)	1	3,300	130–35,000	--
Chromium	mg/kg (ppm)	1	16	1.5–40[c]	30
Cobalt	mg/kg (ppm)	1	11.8	2.5–60[c]	--
Copper	mg/kg (ppm)	1	25.6	1–50	50
Iron	mg/kg (ppm)	1	29,900	2,000–550,000	--
Lead	mg/kg (ppm)	1	22.3	4–61[d]	63
Magnesium	mg/kg (ppm)	1	4,710	100–5,000	--
Manganese	mg/kg (ppm)	1	841	50–5,000	1,600
Mercury	mg/kg (ppm)	1	0.03	0.001–0.2	0.18
Nickel	mg/kg (ppm)	1	24.3	0.5–25	30
Potassium	mg/kg (ppm)	1	1,190	8,500–43,000[c]	--
Selenium	mg/kg (ppm)	1	3.81	0.1–3.9	3.9
Silver	mg/kg (ppm)	1	5.4	--	2
Sodium	mg/kg (ppm)	1	<500	6,000–8,000	--
Thallium	mg/kg (ppm)	1	<1.00	--	--
Vanadium	mg/kg (ppm)	1	19.3	1–300	--
Zinc	mg/kg (ppm)	1	109	9–50	109

N - Number of samples
-- No reference standard available
[a] NYSDEC: Technical and Administrative Guidance Memorandum (TAGM) #4046.
[b] 6 NYCRR Subpart 375-6.8(a) Remedial Program Soil Cleanup Objectives
[c] New York State background
[d] Background levels for lead vary widely. Average levels in undeveloped rural areas may range from 4–61 ppm (reported here). Average background levels in metropolitain or suburban areas, or near highways are much higher and typically range from 200–500 ppm.

TABLE F-2D
2007 Radioactivity in Surface Soils Collected at Air Stations Around the WVDP

Analyte	*Units*	*N*	*SFRSPRD*		*Background Location SFGRVAL*
Gross Alpha	µCi/g	1	1.73±0.42E-05	--	1.69±0.47E-05
Gross Beta	µCi/g	1	2.11±0.31E-05	--	2.18±0.32E-05
K-40	µCi/g	1	1.11±0.12E-05	--	1.28±0.10E-05
Co-60	µCi/g	1	1.61±2.82E-08	--	1.35±1.69E-08
Sr-90	µCi/g	1	8.26±3.75E-08	--	6.62±3.74E-08
Cs-137	µCi/g	1	1.47±0.14E-06	--	5.20±0.58E-07
U-232	µCi/g	1	0.45±2.01E-08	--	-1.85±8.63E-09
U-233/234	µCi/g	1	7.89±1.31E-07	--	6.75±1.18E-07
U-235/236	µCi/g	1	4.51±3.34E-08	--	4.78±3.27E-08
U-238	µCi/g	1	7.15±1.24E-07	--	7.98±1.27E-07
Total U	µg/g	1	1.83±0.05E+00	--	2.26±0.06E+00
Pu-238	µCi/g	1	0.95±1.86E-08	--	0.94±1.79E-08
Pu-239/240	µCi/g	1	3.80±3.72E-08	--	2.60±2.64E-08
Am-241	µCi/g	1	1.16±1.80E-08	--	0.41±1.75E-08
Analyte	*Units*	*N*	*SFFXVRD*	*SFRT240*	*Background Location SFGRVAL*
Gross Alpha	µCi/g	1	1.21±0.43E-05	1.51±0.45E-05	1.69±0.47E-05
Gross Beta	µCi/g	1	1.91±0.32E-05	2.04±0.29E-05	2.18±0.32E-05
K-40	µCi/g	1	9.75±0.88E-06	1.20±0.11E-05	1.28±0.10E-05
Co-60	µCi/g	1	1.65±2.29E-08	2.63±2.78E-08	1.35±1.69E-08
Sr-90	µCi/g	1	-1.68±2.54E-08	1.66±0.48E-07	6.62±3.74E-08
Cs-137	µCi/g	1	1.21±0.11E-06	5.10±0.60E-07	5.20±0.58E-07
Pu-238	µCi/g	1	0.00±1.28E-08	0.32±1.29E-08	0.94±1.79E-08
Pu-239/240	µCi/g	1	3.60±3.16E-08	1.56±2.15E-08	2.60±2.64E-08
Am-241	µCi/g	1	1.36±1.83E-08	-0.73±1.39E-08	0.41±1.75E-08
Analyte	*Units*	*N*	*SFWEVAL*	*SFSPRVL*	*Background Location SFGRVAL*
Gross Alpha	µCi/g	1	1.09±0.43E-05	1.65±0.46E-05	1.69±0.47E-05
Gross Beta	µCi/g	1	1.78±0.30E-05	2.07±0.32E-05	2.18±0.32E-05
K-40	µCi/g	1	1.31±0.12E-05	1.20±0.13E-05	1.28±0.10E-05
Co-60	µCi/g	1	1.73±2.76E-08	2.41±2.57E-08	1.35±1.69E-08
Sr-90	µCi/g	1	-2.68±2.64E-08	1.73±3.04E-08	6.62±3.74E-08
Cs-137	µCi/g	1	2.49±0.48E-07	4.55±0.75E-07	5.20±0.58E-07
Pu-238	µCi/g	1	0.72±1.40E-08	-3.03±4.20E-09	0.94±1.79E-08
Pu-239/240	µCi/g	1	1.80±2.47E-08	0.63±1.24E-08	2.60±2.64E-08
Am-241	µCi/g	1	0.96±1.68E-08	-0.86±1.28E-08	0.41±1.75E-08

N - Number of samples

TABLE F-2E
2007 Radioactivity in Stream Sediments Around the WVDP

Analyte	Units	N	SFCCSED	SFSDSED	N	Background Location SFBISED [a]
Gross Alpha	µCi/g	0	NR	NR	10	1.16±0.35E-05
Gross Beta	µCi/g	1	1.72±0.33E-05	1.57±0.30E-05	10	1.69±0.29E-05
K-40	µCi/g	1	1.08±0.08E-05	1.41±0.09E-05	10	1.37±0.15E-05
Co-60	µCi/g	1	-0.29±1.40E-08	0.31±1.08E-08	10	0.02±1.62E-08
Sr-90	µCi/g	1	-2.57±2.70E-08	-3.51±2.68E-08	10	0.04±4.97E-08
Cs-137	µCi/g	1	1.03±0.22E-07	9.99±1.91E-08	10	3.73±2.27E-08
U-232	µCi/g	1	1.36±2.40E-08	0.22±2.36E-08	10	0.00±5.52E-08
U-233/234	µCi/g	1	5.62±0.86E-07	7.16±0.98E-07	10	5.42±1.19E-07
U-235/236	µCi/g	1	4.10±2.74E-08	6.05±2.96E-08	10	5.73±3.88E-08
U-238	µCi/g	1	5.90±0.88E-07	8.45±1.07E-07	10	5.30±1.14E-07
Total U	µg/g	0	NR	NR	10	1.91±0.04E+00
Pu-238	µCi/g	1	0.55±1.33E-08	1.09±1.87E-08	10	1.11±1.86E-08
Pu-239/240	µCi/g	1	0.35±1.36E-08	-0.13±1.07E-08	10	1.44±1.44E-08
Am-241	µCi/g	1	0.16±1.62E-08	0.77±1.70E-08	10	1.70±2.24E-08
Analyte	**Units**	**N**	**SFTCSED**	**--**	**N**	**Background Location SFBCSED [b]**
Gross Alpha	µCi/g	0	NR	--	10	7.71±2.96E-06
Gross Beta	µCi/g	1	1.85±0.33E-05	--	10	1.67±0.30E-05
K-40	µCi/g	1	1.16±0.09E-05	--	10	1.41±0.14E-05
Co-60	µCi/g	1	-0.16±1.21E-08	--	10	0.05±2.01E-08
Sr-90	µCi/g	1	1.66±3.26E-08	--	10	2.69±5.21E-08
Cs-137	µCi/g	1	5.38±0.51E-07	--	10	3.74±2.76E-08
U-232	µCi/g	1	2.80±3.08E-08	--	10	2.01±5.75E-08
U-233/234	µCi/g	1	5.49±0.91E-07	--	10	6.66±1.25E-07
U-235/236	µCi/g	1	1.44±2.02E-08	--	10	5.37±3.72E-08
U-238	µCi/g	1	5.55±0.90E-07	--	10	6.98±1.28E-07
Total U	µg/g	0	NR	--	10	2.14±0.05E+00
Pu-238	µCi/g	1	0.27±1.08E-08	--	10	0.87±1.58E-08
Pu-239/240	µCi/g	1	0.54±1.52E-08	--	10	0.21±1.23E-08
Am-241	µCi/g	1	-0.77±1.67E-08	--	10	0.61±1.49E-08

N - Number of samples
NR - Gross alpha and total uranium results not reported due to failure of analytical quality control.
-- Not applicable; no additional sampling location
[a] Sediment sampling at Bigelow Bridge (SFBISED), the upstream Cattaraugus Creek background, was discontinued in 2005. The ten-year historical average is used as the comparative reference for the Cattaraugus Creek locations.
[b] Sampling data at the location upstream in Buttermilk Creek (SFBCSED) is presented as a ten-year rolling average and is used as a comparative reference for Thomas Corners in Buttermilk Creek (SFTCSED), immediately downstream of facility effluents.

APPENDIX G

Summary of Direct Radiation Monitoring Data

TABLE G-1
Summary of 2007 Quarterly Averages of Off-Site TLD Measurements
(mR±2 SD/quarter)

Location Number[a]	*1st Quarter*	*2nd Quarter*	*3rd Quarter*	*4th Quarter*	*Location Average*
DFTLD01	14±3	21±5	21±4	17±8	18±5
DFTLD02	14±3	22±5	21±4	16±8	18±5
DFTLD03	12±3	19±5	17±4	14±8	16±5
DFTLD04	13±3	21±5	20±4	18±8	18±5
DFTLD05	14±3	22±5	19±4	16±8	18±5
DFTLD06	14±3	21±5	20±4	15±8	17±5
DFTLD07	11±3	18±4	16±4	16±8	15±5
DFTLD08	14±3	23±5	21±4	17±8	19±6
DFTLD09	14±3	22±5	20±4	19±9	19±6
DFTLD10	13±3	21±5	19±4	19±9	18±6
DFTLD11	11±3	18±4	17±4	14±8	15±5
DFTLD12	14±3	21±5	20±4	19±9	18±6
DFTLD13	14±3	24±5	21±5	22±9	20±6
DFTLD14	13±3	20±5	22±5	20±9	19±4
DFTLD15	12±3	20±5	20±4	15±8	17±5
DFTLD16	14±3	21±5	19±4	17±8	18±5
DFTLD20	11±3	19±5	16±4	11±7	14±5
DFTLD21	14±3	23±5	20±4	14±8	18±5
DFTLD22	14±3	22±5	26±5	16±8	19±6
DFTLD23	15±3	20±5	20±4	14±8	17±5

[a] Off-site locations are shown on Figures A-12, A-13, and A-14.

Conversion factor: Milliroentgen (mR) units are used to report exposure rates in air. To convert mR to mrem (dose to humans), a conversion factor of 1.03 must be applied. For example, a reported exposure rate of 18.1 mR/quarter would be equivalent to 18.6 mrem/quarter (based upon dose-equivalent phantom calibration using cesium-137).

TABLE G-2
Summary of 2007 Quarterly Averages of On-Site TLD Measurements
(mR±2 SD/quarter)

Location Number [a]	*1st Quarter*	*2nd Quarter*	*3rd Quarter*	*4th Quarter*	*Location Average*
DNTLD19	17±4	27±6	24±5	16±8	21±6
DNTLD24	394±77	357±70	404±79	425±86	395±78
DNTLD25	17±4	24±5	23±5	19±9	21±6
DNTLD26	19±4	26±6	23±5	23±9	23±6
DNTLD27	15±3	22±5	21±5	23±9	20±6
DNTLD28	20±4	38±8	27±6	17±8	25±7
DNTLD29	17±4	24±6	21±5	23±9	21±6
DNTLD30	18±4	26±6	23±5	18±8	21±6
DNTLD33	37±7	54±11	42±8	23±9	39±9
DNTLD35	113±22	1,298±255	263±52	23±9	424±130
DNTLD36	136±27	458±90	123±24	39±12	189±49
DNTLD38	30±6	37±8	34±7	35±11	34±8
DNTLD39	45±9	56±11	51±10	47±13	49±11
DNTLD40	99±19	108±21	96±19	94±22	99±20
DNTLD43	48±10	69±14	50±10	14±8	45±10

[a] On-site locations are shown on Figure A-11.

Conversion factor: Milliroentgen (mR) units are used to report exposure rates in air. To convert mR to mrem (dose to humans), a conversion factor of 1.03 must be applied. For example, a reported exposure rate of 18.1 mR/quarter would be equivalent to 18.6 mrem/quarter (based upon dose-equivalent phantom calibration using cesium-137).

TABLE G-3
Third-Quarter 2007 TLD Results and Instantaneous Exposure Rate Readings With a High-Pressure Ion Chamber (HPIC) at Each Monitoring Location

Location Number	*3rd Quarter TLD Result (µR/hr)*	*2007 HPIC Results (µR/hr)*	*Location Number*	*3rd Quarter TLD Result (µR/hr)*	*2007 HPIC Results (µR/hr)*
DFTLD01	9.4	10.5	DFTLD22	11.8	10.1
DFTLD02	9.4	10.2	DFTLD23	9.0	9.3
DFTLD03	7.6	9.1	DNTLD19	10.8	11.4
DFTLD04	8.9	9.1	DNTLD24	182.8	211.8
DFTLD05	8.8	9.4	DNTLD25	10.6	12.2
DFTLD06	9.0	9.6	DNTLD26	10.5	11.0
DFTLD07	7.4	9.0	DNTLD27	9.6	10.3
DFTLD08	9.5	9.1	DNTLD28	12.3	13.8
DFTLD09	9.0	9.4	DNTLD29	9.6	11.1
DFTLD10	8.5	9.6	DNTLD30	10.5	10.5
DFTLD11	7.8	8.9	DNTLD33	19.0	14.9
DFTLD12	8.9	10.3	DNTLD35	119.1	69.3
DFTLD13	9.6	9.7	DNTLD36	55.8	59.1
DFTLD14	10.1	10.0	DNTLD38	15.6	21.6
DFTLD15	9.1	9.3	DNTLD39	23.0	27.3
DFTLD16	8.6	9.7	DNTLD40	43.5	51.8
DFTLD20	7.3	8.1	DNTLD43	22.4	15.2
DFTLD21	9.0	10.1			

Note: DF* represents off-site TLD locations; DN* represents on-site TLD locations.

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APPENDIX H

Summary of Quality Assurance Crosscheck Analyses

TABLE H-1
Crosscheck Sample Comparisons From the DOE Mixed Analyte Performance Evaluation Program (MAPEP)[a]; Study 17; May 2007

Analyte	*Matrix*	*Units*	*Actual*	*Reported*	*Acceptance Range*	*Accept?[b]*	*Analyzed by:*
MAPEP - 07 - GrF17 Gross Alpha/Beta Air Filter							
Gross Alpha	Air Filter	Bq/sample	0.601	0.130	>0.0–1.202	Yes	ELAB
Gross Beta	Air Filter	Bq/sample	0.441	0.484	0.221–0.662	Yes	ELAB
MAPEP - 07 - RdF17 Radiological Air Filter							
Am-241	Air Filter	Bq/sample	0.0977	0.103	0.0684–0.1270	Yes	GEL
Cs-137	Air Filter	Bq/sample	2.5693	2.560	1.7985–3.3401	Yes	GEL
Co-60	Air Filter	Bq/sample	2.9054	3.043	2.0338–3.7770	Yes	GEL
Pu-238	Air Filter	Bq/sample	0.0669	0.068	0.0468–0.0870	Yes	GEL
Pu-239/240	Air Filter	Bq/sample	0.0839	0.085	0.0587–0.1091	Yes	GEL
Sr-90	Air Filter	Bq/sample	0.6074	0.577	0.4252–0.7896	Yes	GEL
U-233/234	Air Filter	Bq/sample	0.0981	0.100	0.0687–0.1275	Yes	GEL
U-238	Air Filter	Bq/sample	0.1021	0.112	0.0715–0.1327	Yes	GEL
MAPEP - 07 - GrW17 Gross Alpha/Beta Water Standard							
Gross Alpha	Water	Bq/L	0.327	0.951	>0.0–0.654	No	ELAB
Gross Beta	Water	Bq/L	0.851	0.944	0.426–1.277	Yes	ELAB
Gross Alpha	Water	Bq/L	0.327	0.466	>0.0–0.654	Yes	GEL
Gross Beta	Water	Bq/L	0.851	0.963	0.426–1.277	Yes	GEL
MAPEP - 07 - MaW17 Water Standard - Radiological							
Cs-137	Water	Bq/L	163.0	166	114.1–211.9	Yes	ELAB
Co-60	Water	Bq/L	26.9	27.3	18.8–35.0	Yes	ELAB
H-3	Water	Bq/L	283.0	295	198.1–367.9	Yes	ELAB
Sr-90	Water	Bq/L	8.87	9.29	6.21–11.53	Yes	ELAB
Am-241	Water	Bq/L	1.71	1.523	1.20–2.22	Yes	GEL
Cs-134	Water	Bq/L	83.5	76.5	58.5–108.6	Yes	GEL
Cs-137	Water	Bq/L	163.0	169.0	114.1–211.9	Yes	GEL
Co-60	Water	Bq/L	26.9	27.3	18.8–35.0	Yes	GEL
H-3	Water	Bq/L	283.0	308.0	198.1–367.9	Yes	GEL
Pu-238	Water	Bq/L	2.25	2.017	1.58–2.93	Yes	GEL
Pu-239/240	Water	Bq/L	2.22	1.993	1.55–2.89	Yes	GEL
Sr-90	Water	Bq/L	8.87	9.07	6.21–11.53	Yes	GEL
Tc-99	Water	Bq/L	10.5	9.9	7.4–13.7	Yes	GEL
U-233/234	Water	Bq/L	2.49	2.653	1.74–3.24	Yes	GEL
U-238	Water	Bq/L	2.48	2.590	1.74–3.24	Yes	GEL

ELAB - Environmental Laboratory
GEL - General Engineering Laboratory
Note: This report includes only those matrix/analyte combinations performed in support of the analysis of samples collected at the WVDP and for which results are presented in this Annual Site Environmental Report.
[a] MAPEP monitors performance and requests corrective action as required.
[b] "Yes" - Result acceptable; "Pass" - Result acceptable with warning; "No" - Result not acceptable.

TABLE H-1 *(continued)*
Crosscheck Sample Comparisons From the DOE Mixed Analyte Performance Evaluation Program (MAPEP)[a]; Study 17; May 2007

Analyte	Matrix	Units	Actual	Reported	Acceptance Range	Accept? [b]	Analyzed by:
MAPEP - 07- MaW17 Water Standard - Metals							
Antimony	Water	mg/L	2.07	2.09	1.45–2.69	Yes	LVLI
Arsenic	Water	mg/L	2.44	2.46	1.71–3.17	Yes	LVLI
Barium	Water	mg/L	0.675	0.692	0.473–0.878	Yes	LVLI
Beryllium	Water	mg/L	0.497	0.503	0.348–0.646	Yes	LVLI
Cadmium	Water	mg/L	0.797	0.809	0.558–1.036	Yes	LVLI
Chromium	Water	mg/L	1.98	2.03	1.39–2.57	Yes	LVLI
Cobalt	Water	mg/L	1.70	1.72	1.19–2.21	Yes	LVLI
Copper	Water	mg/L	<0.025	0.0046	[c]	Yes	LVLI
Lead	Water	mg/L	0.894	0.915	0.626–1.162	Yes	LVLI
Mercury	Water	mg/L	0.0177	0.0177	0.0124–0.0230	Yes	LVLI
Nickel	Water	mg/L	<0.01	0.0022	[c]	Yes	LVLI
Selenium	Water	mg/L	0.573	0.565	0.401–0.745	Yes	LVLI
Thallium	Water	mg/L	0.848	0.863	0.592–1.102	Yes	LVLI
Uranium - total	Water	mg/L	0.201	0.188	0.141–0.261	Yes	LVLI
Vanadium	Water	mg/L	1.22	1.260	0.85–1.59	Yes	LVLI
Zinc	Water	mg/L	3.30	3.330	2.31–4.29	Yes	LVLI
MAPEP - 07 - MaS17 Soil Standard - Metals							
Antimony	Soil	mg/kg	84	88.4	59–109	Yes	LVLI
Arsenic	Soil	mg/kg	37	37.0	26–48	Yes	LVLI
Barium	Soil	mg/kg	121	116	85–157	Yes	LVLI
Beryllium	Soil	mg/kg	45.3	40.2	31.7–58.9	Yes	LVLI
Cadmium	Soil	mg/kg	11.0	9.5	7.7–14.3	Yes	LVLI
Chromium	Soil	mg/kg	71	71.7	50–92	Yes	LVLI
Cobalt	Soil	mg/kg	110	113	77–143	Yes	LVLI
Copper	Soil	mg/kg	120	116	84–156	Yes	LVLI
Lead	Soil	mg/kg	69	68.1	48–90	Yes	LVLI
Nickel	Soil	mg/kg	79	79.5	55–103	Yes	LVLI
Selenium	Soil	mg/kg	<0.2	<0.30	[c]	Yes	LVLI
Silver	Soil	mg/kg	88.3	78.3	61.8–114.8	Yes	LVLI
Thallium	Soil	mg/kg	118	112	83–153	Yes	LVLI
Uranium - total	Soil	mg/kg	15.6	9.3	10.9–20.3	No	LVLI
Vanadium	Soil	mg/kg	79	77.7	55–103	Yes	LVLI
Zinc	Soil	mg/kg	67	64.4	47–87	Yes	LVLI

LVLI - Lionville Laboratories, Inc.
Note: This report includes only those matrix/analyte combinations performed in support of the analysis of samples collected at the WVDP and for which results are presented in this Annual Site Environmental Report.
[a] MAPEP monitors performance and requests corrective action as required.
[b] “Yes” - Result acceptable; “Pass” - Result acceptable with warning; “No” - Result not acceptable.
[c] Although no actual value or acceptable range was provided, the results were assessed by MAPEP as acceptable.

TABLE H-1 *(continued)*
Crosscheck Sample Comparisons From the DOE Mixed Analyte Performance Evaluation Program (MAPEP)[a]; Study 17; May 2007

Analyte	*Matrix*	*Units*	*Actual*	*Reported*	*Acceptance Range*	*Accept?*[b]	*Analyzed by:*
MAPEP - 07 - RdV17 Vegetation Standard - Radiological							
Am-241	Veg	Bq/sample	0.1806	0.203	0.1264–0.2348	Yes	GEL
Cs-137	Veg	Bq/sample	6.9949	6.157	4.8964–9.0934	Yes	GEL
Co-60	Veg	Bq/sample	5.8215	5.985	4.0751–7.5680	Yes	GEL
Pu-238	Veg	Bq/sample	0.1484	0.153	0.1039–0.1929	Yes	GEL
Pu-239/240	Veg	Bq/sample	0.2135	0.204	0.1495–0.2776	Yes	GEL
Sr-90	Veg	Bq/sample	1.5351	1.450	1.0746–1.9956	Yes	GEL
U-233/234	Veg	Bq/sample	0.2624	0.321	0.1837–0.3411	Pass	GEL
U-238	Veg	Bq/sample	0.2724	0.311	0.1907–0.3541	Yes	GEL
MAPEP - 07 - OrW17 Water Standard - Semivolatile Organic Compounds							
Phenol	Water	µg/L	181.2	120	18.1–242.1	Yes	LVLI
2-Chlorophenol	Water	µg/L	69.8	47	21.3–88.4	Yes	LVLI
1,3-Dichlorobenzene	Water	µg/L	99.4	58	12.3–116.0	Yes	LVLI
1,4-Dichlorobenzene	Water	µg/L	[c]	<10	[c]	Yes	LVLI
1,2-Dichlorobenzene	Water	µg/L	74.3	47	8.4–90.6	Yes	LVLI
Hexachloroethane	Water	µg/L	104.3	53	10.5–122.3	Yes	LVLI
Nitrobenzene	Water	µg/L	[c]	<10	[c]	Yes	LVLI
Isophorone	Water	µg/L	[c]	<10	[c]	Yes	LVLI
2-Nitrophenol	Water	µg/L	154.2	95	35.1–202.6	Yes	LVLI
2,4-Dimethylphenol	Water	µg/L	179.1	110	40.5–233.7	Yes	LVLI
2,4-Dichlorophenol	Water	µg/L	89.4	64	28.3–111.7	Yes	LVLI
1,2,4-Trichlorobenzene	Water	µg/L	54.3	39	10.7–67.5	Yes	LVLI
Napthalene	Water	µg/L	97.4	61	26.2–116.4	Yes	LVLI
Hexachlorobutadiene	Water	µg/L	62.7	38	6.3–78.2	Yes	LVLI
4-Chloro-3-methylphenol	Water	µg/L	184.1	120	72.9–236.5	Yes	LVLI
2-Methylnaphthalene	Water	µg/L	[c]	<10	[c]	Yes	LVLI
2-Methylphenol	Water	µg/L	56.4	35	10.7–71.3	Yes	LVLI
Hexachlorocyclopentadiene	Water	µg/L	[c]	<10	[c]	Yes	LVLI
3 Methyl and 4-Methylphenol	Water	µg/L	121.8	72	12.2–157.4	Yes	LVLI
2,4,6-Trichlorophenol	Water	µg/L	79.6	52	25.4–101.6	Yes	LVLI
2-Chloronaphthalene	Water	µg/L	87.1	56	26.5–105.6	Yes	LVLI
Dimethylphthalate	Water	µg/L	111.5	73	11.2–161.9	Yes	LVLI
Acenaphthylene	Water	µg/L	[c]	<10	[c]	Yes	LVLI
2,6-Dinitrotoluene	Water	µg/L	48.2	34	18.9–60.8	Yes	LVLI
Acenaphthene	Water	µg/L	[c]	<10	[c]	Yes	LVLI
2,4-Dinitrotoluene	Water	µg/L	57.7	40	20.2–73.9	Yes	LVLI
2,4-Dinitrophenol	Water	µg/L	[c]	<26	[c]	Yes	LVLI
Dibenzofuran	Water	µg/L	[c]	<10	[c]	Yes	LVLI

GEL - General Engineering Laboratory
LVLI - Lionville Laboratories, Inc.
Note: This report includes only those matrix/analyte combinations performed in support of the analysis of samples collected at the WVDP and for which results are presented in this Annual Site Environmental Report.
[a] MAPEP monitors performance and requests corrective action as required.
[b] “Yes” - Result acceptable; “Pass” - Result acceptable with warning; “No” - Result not acceptable.
[c] Although no actual value or acceptable range was provided, the results were assessed by MAPEP as acceptable.

TABLE H-1 *(concluded)*
Crosscheck Sample Comparisons From the DOE Mixed Analyte Performance Evaluation Program (MAPEP)[a]; Study 17; May 2007

Analyte	*Matrix*	*Units*	*Actual*	*Reported*	*Acceptance Range*	*Accept?*[b]	*Analyzed by:*
MAPEP - 07 - OrW17 Water Standard - Semivolatile Organic Compounds (concluded)							
4-Nitrophenol	Water	µg/L	120.8	61	12.1–163.4	Yes	LVLI
Fluorene	Water	µg/L	80.7	52	34.2–97.6	Yes	LVLI
Diethylphthalate	Water	µg/L	127.8	78	23.8–174.4	Yes	LVLI
4,6-Dinitro-2-methylphenol	Water	µg/L	[c]	<26	[c]	Yes	LVLI
2,4,5-Trichlorophenol	Water	µg/L	126.2	77	44.4–160.9	Yes	LVLI
Hexachlorobenzene	Water	µg/L	101.9	73	44.3–124.9	Yes	LVLI
Pentachlorophenol	Water	µg/L	[c]	<26	[c]	Yes	LVLI
Phenanthrene	Water	µg/L	134.7	81	61.4–160.5	Yes	LVLI
Anthracene	Water	µg/L	20.7	20	9.3–27.9	Yes	LVLI
Di-n-butylphthalate	Water	µg/L	104.5	66	34.2–136.4	Yes	LVLI
Fluoranthene	Water	µg/L	54.8	38	25.1–68.9	Yes	LVLI
Pyrene	Water	µg/L	134.7	79	44.8–181.3	Yes	LVLI
Butylbenzylphthalate	Water	µg/L	102.9	80	18.4–147.8	Yes	LVLI
Benzo(a)anthracene	Water	µg/L	109.3	77	49.8–138.3	Yes	LVLI
Chrysene	Water	µg/L	[c]	<10	[c]	Yes	LVLI
Bis(2-ethylhexyl)phthalate	Water	µg/L	[c]	<10	[c]	Yes	LVLI
Di-n-octylphthalate	Water	µg/L	44.8	28	14.6–68.7	Yes	LVLI
Benzo(b)fluoranthene	Water	µg/L	45.0	27	16.0–61.6	Yes	LVLI
Benzo(k)fluoranthene	Water	µg/L	103.2	59	25.8–147.9	Yes	LVLI
Benzo(a)pyrene	Water	µg/L	28.7	19	8.9–38.8	Yes	LVLI
Indeno(1,2,3-c,d)pyrene	Water	µg/L	[c]	<10	[c]	Yes	LVLI
Dibenzo(a,h)anthracene	Water	µg/L	54.9	39	15.1–77.9	Yes	LVLI
Benzo(g,h,i)perylene	Water	µg/L	65.3	51	23.3–89.7	Yes	LVLI

LVLI - Lionville Laboratories, Inc.

Note: This report includes only those matrix/analyte combinations performed in support of the analysis of samples collected at the WVDP and for which results are presented in this Annual Site Environmental Report.

[a] MAPEP monitors performance and requests corrective action as required.

[b] “Yes” - Result acceptable; “Pass” - Result acceptable with warning; “No” - Result not acceptable.

[c] Although no actual value or acceptable range was provided, the results were assessed by MAPEP as acceptable.

TABLE H-2
Comparisons of Results From Crosscheck Samples Analyzed for Water Quality Parameters as Part of the EPA's 2007 Discharge Monitoring Report - Quality Assurance (DMR-QA) Study 27 for the National Pollutant Discharge Elimination System (NPDES)

Analyte	*Units*	*Actual*	*Reported*	*Acceptance Range* [a]	*Accept?* [b]	*Analyzed by:*
Aluminum	µg/L	700	734	554–843	Yes	TestAmerica
Ammonia (as Nitrogen)	mg/L	6.47	6.27	4.74–8.19	Yes	TestAmerica
Antimony	µg/L	366	344	252–442	Yes	TestAmerica
Arsenic	µg/L	612	591	514–716	Yes	TestAmerica
Barium	µg/L	406	391	352–458	Yes	TestAmerica
Biochemical oxygen demand	mg/L	88.6	118	44.7–132	Yes	TestAmerica
Cadmium	µg/L	425	398	362–483	Yes	TestAmerica
Chlorine (total residual)	mg/L	1.32	1.33	0.948–1.64	Yes	WWTF
Chromium	µg/L	401	387	348–454	Yes	TestAmerica
Chromium (hexavalent)	µg/L	412	384	311–453	Yes	TestAmerica
Cobalt	µg/L	541	529	475–606	Yes	TestAmerica
Copper	µg/L	716	703	644–788	Yes	TestAmerica
Cyanide, total	mg/L	0.360	0.371	0.193–0.532	Yes	TestAmerica
Iron	µg/L	833	859	735–942	Yes	TestAmerica
Lead	µg/L	571	574	498–642	Yes	TestAmerica
Manganese	µg/L	844	866	758–938	Yes	TestAmerica
Mercury	µg/L	8.38	7.72	5.16–11.4	Yes	GEL
Nickel	µg/L	899	881	809–1,000	Yes	TestAmerica
Nitrate (as Nitrogen)	mg/L	7.79	8.54	6.07–9.41	Yes	TestAmerica
Nitrite (as Nitrogen)	mg/L	2.68	2.56	2.27–3.09	Yes	TestAmerica
Nitrogen (total Kjeldahl)	mg/L	11.4	8.13	7.58–14.8	Yes	TestAmerica
Oil & Grease (Gravimetric)	mg/L	67.5	57.0	45.8–80.3	Yes	TestAmerica
pH	SU	5.70	5.74	5.50–5.90	Yes	ELAB
Phosphorus (total, as P)	mg/L	4.56	4.49	3.74–5.44	Yes	TestAmerica
Selenium	µg/L	609	608	482–706	Yes	TestAmerica
Silver	µg/L	345	338	296–395	Yes	TestAmerica
Sulfate	mg/L	18.6	20.4	14.4–22.4	Yes	TestAmerica
Settleable solids	mL/L	30.6	31	24.2–39.2	Yes	WWTF
Suspended solids (total)	mg/L	66.8	67.2	53.6–75.1	Yes	TestAmerica
Total dissolved solids	mg/L	310	312	233–387	Yes	ELAB
Vanadium	µg/L	455	443	398–509	Yes	TestAmerica
Zinc	µg/L	360	360	308–418	Yes	TestAmerica

GEL - General Engineering Laboratory
ELAB - WVDP Environmental Laboratory
TestAmerica - TestAmerica Laboratories, Inc., Buffalo
WWTF - WVDP Wastewater Treatment Facility Laboratory
Note: Samples provided by Environmental Research Associates (ERA)

[a] Acceptance limits are determined by ERA or the New York State Department of Health (NYSDOH), as applicable.

[b] "Yes" - Result acceptable; "Pass" - Result acceptable but outside warning limits; "No" - Result not acceptable.

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APPENDIX I

West Valley Demonstration Project Act

West Valley Demonstration Project Act
(Public Law 96-368 [S. 2443]; October 1, 1980)

(As presented in Exhibit G of the Cooperative Agreement between United States Department of Energy and New York State Energy Research and Development Authority on the Western New York Nuclear Service Center at West Valley, New York; Effective October 1, 1980 as amended September 18, 1981.)

EXHIBIT G

WEST VALLEY PROJECT DEMONSTRATION ACT

PUBLIC LAW 96-368 [S. 2443]; October 1, 1980

WEST VALLEY DEMONSTRATION PROJECT ACT

For Legislative History of this and other Laws, see Table 1, Public Laws and Legislative History, at end of final volume

An Act to authorize the Department of Energy to carry out a high-level liquid nuclear waste management demonstration project at the Western New York Service Center in West Valley, New York.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled,

West Valley Demonstration Project Act. 42 USC 2021a note.

SECTION 1. This Act may be cited as the "West Valley Demonstration Project Act".

42 USC 2021a note.

SEC. 2. (a) The Secretary shall carry out, in accordance with this Act, a high level radioactive waste management demonstration project at the Western New York Service Center in West Valley, New York, for the purpose of demonstrating solidification techniques which can be used for preparing high level radioactive waste for disposal. Under the project the Secretary shall carry out the following activities:

Activities.

(1) The Secretary shall solidify, in a form suitable for transportation and disposal, the high level radioactive waste at the Center by vitrification or by such other technology which the Secretary determines to be the most effective for solidification.

(2) The Secretary shall develop containers suitable for the permanent disposal of the high level radioactive waste solidified at the Center.

(3) The Secretary shall, as soon as feasible, transport, in accordance with applicable provisions of law, the waste solidified at the Center to an appropriate Federal repository for permanent disposal.

(4) The Secretary shall, in accordance with applicable licensing requirements, dispose of low level radioactive waste and transuranic waste produced by the solidification of the high level radioactive waste under the project.

(5) The Secretary shall decontaminate and decommission—

(A) the tanks and other facilities of the Center in which the high level radioactive waste solidified under the project was stored,

(B) the facilities used in the solidification of the waste, and

(C) any material and hardware used in connection with the project,

in accordance with such requirements as the Commission may prescribe.

(b) Before undertaking the project and during the fiscal year ending September 30, 1981, the Secretary shall carry out the following:

Hearings.

(1) The Secretary shall hold in the vicinity of the Center public hearings to inform the residents of the area in which the Center is located of the activities proposed to be undertaken under the project and to receive their comments on the project.

(2) The Secretary shall consider the various technologies available for the solidification and handling of high level radioactive waste taking into account the unique characteristics of such waste at the Center.

94 STAT. 1347

G-1

(3) The Secretary shall—

(A) undertake detailed engineering and cost estimates for the project.

(B) prepare a plan for the safe removal of the high level radioactive waste at the Center for the purposes of solidification and include in the plan provisions respecting the safe breaching of the tanks in which the waste is stored, operating equipment to accomplish the removal, and sluicing techniques,

(C) conduct appropriate safety analyses of the project, and

(D) prepare required environmental impact analyses of the project.

(4) The Secretary shall enter into a cooperative agreement with the State in accordance with the Federal Grant and Cooperative Agreement Act of 1977 under which the State will carry out the following:

42 USC 501 note.

(A) The State will make available to the Secretary the facilities of the Center and the high level radioactive waste at the Center which are necessary for the completion of the project. The facilities and the waste shall be made available without the transfer of title and for such period as may be required for completion of the project.

(B) The Secretary shall provide technical assistance in securing required license amendments.

State costs, percentage.

(C) The State shall pay 10 per centum of the costs of the project, as determined by the Secretary. In determining the costs of the project, the Secretary shall consider the value of the use of the Center for the project. The State may not use Federal funds to pay its share of the cost of the project, but may use the perpetual care fund to pay such share.

Licensing amendment application.

(D) Submission jointly by the Department of Energy and the State of New York of an application for a licensing amendment as soon as possible with the Nuclear Regulatory Commission providing for the demonstration.

(c) Within one year from the date of the enactment of this Act, the Secretary shall enter into an agreement with the Commission to establish arrangements for review and consultation by the Commission with respect to the project: *Provided,* That review and consultation by the Commission pursuant to this subsection shall be conducted informally by the Commission and shall not include nor require formal procedures or actions by the Commission pursuant to the Atomic Energy Act of 1954, as amended, the Energy Reorganization Act of 1974, as amended, or any other law. The agreement shall provide for the following:

42 USC 2011 note.
42 USC 5801 note.

(1) The Secretary shall submit to the Commission, for its review and comment, a plan for the solidification of the high level radioactive waste at the Center, the removal of the waste for purposes of its solidification, the preparation of the waste for disposal, and the decontamination of the facilities to be used in solidifying the waste. In preparing its comments on the plan, the Commission shall specify with precision its objections to any provision of the plan. Upon submission of a plan to the Commission, the Secretary shall publish a notice in the Federal Register of the submission of the plan and of its availability for public inspection, and, upon receipt of the comments of the Commission respecting a plan, the Secretary shall publish a notice in the Federal Register of the receipt of the comments and of the availability of the comments for public inspection. If the Secre-

Publications in Federal Register.

tary does not revise the plan to meet objections specified in the comments of the Commission, the Secretary shall publish in the Federal Register a detailed statement for not so revising the plan.

(2) The Secretary shall consult with the Commission with respect to the form in which the high level radioactive waste at the Center shall be solidified and the containers to be used in the permanent disposal of such waste.

Reports and other information to Commission.

(3) The Secretary shall submit to the Commission safety analysis reports and such other information as the Commission may require to identify any danger to the public health and safety which may be presented by the project.

(4) The Secretary shall afford the Commission access to the Center to enable the Commission to monitor the activities under the project for the purpose of assuring the public health and safety.

Consultation with EPA and others.

(d) In carrying out the project, the Secretary shall consult with the Administrator of the Environmental Protection Agency, the Secretary of Transportation, the Director of the Geological Survey, and the commercial operator of the Center.

Appropriation authorization. 42 USC 2021a note.

SEC. 3. (a) There are authorized to be appropriated to the Secretary for the project not more than $5,000,000 for the fiscal year ending September 30, 1981.

(b) The total amount obligated for the project by the Secretary shall be 90 per centum of the costs of the project.

(c) The authority of the Secretary to enter into contracts under this Act shall be effective for any fiscal year only to such extent or in such amounts as are provided in advance by appropriation Acts.

Report to Speaker of the House and President pro tempore of the Senate. 42 USC 2021a note.

SEC. 4. Not later than February 1, 1981, and on February 1 of each calendar year thereafter during the term of the project, the Secretary shall transmit to the Speaker of the House of Representatives and the President pro tempore of the Senate an up-to-date report containing a detailed description of the activities of the Secretary in carrying out the project, including agreements entered into and the costs incurred during the period reported on and the activities to be undertaken in the next fiscal year and the estimated costs thereof.

42 USC 2021a note.

SEC. 5. (a) Other than the costs and responsibilities established by this Act for the project, nothing in this Act shall be construed as affecting any rights, obligations, or liabilities of the commercial operator of the Center, the State, or any person, as is appropriate, arising under the Atomic Energy Act of 1954 or under any other law, contract, or agreement for the operation, maintenance, or decontamination of any facility or property at the Center or for any wastes at the Center. Nothing in this Act shall be construed as affecting any applicable licensing requirement of the Atomic Energy Act of 1954 or the Energy Reorganization Act of 1974. This Act shall not apply or be extended to any facility or property at the Center which is not used in conducting the project. This Act may not be construed to expand or diminish the rights of the Federal Government.

42 USC 2011 note.

42 USC 5801 note.

(b) This Act does not authorize the Federal Government to acquire title to any high level radioactive waste at the Center or to the Center or any portion thereof.

Definitions. 42 USC 2021a note.

SEC. 6. For the purposes of this Act:

(1) The term "Secretary" means the Secretary of Energy.

(2) The term "Commission" means the Nuclear Regulatory Commission.

(3) The term "State" means the State of New York.

(4) The term "high level radioactive waste" means the high level radioactive waste which was produced by the reprocessing at the Center of spent nuclear fuel. Such term includes both liquid wastes which are produced directly in reprocessing, dry solid material derived from such liquid waste, and such other material as the Commission designates as high level radioactive waste for purposes of protecting the public health and safety.

(5) The term "transuranic waste" means material contaminated with elements which have an atomic number greater than 92, including neptunium, plutonium, americium, and curium, and which are in concentrations greater than 10 nanocuries per gram, or in such other concentrations as the Commission may prescribe to protect the public health and safety.

(6) The term "low level radioactive waste" means radioactive waste not classified as high level radioactive waste, transuranic waste, or byproduct material as defined in section 11 e. (2) of the Atomic Energy Act of 1954.

42 USC 2014.

(7) The term "project" means the project prescribed by section 2(a).

(8) The term "Center" means the Western New York Service Center in West Valley, New York.

Approved October 1, 1980.